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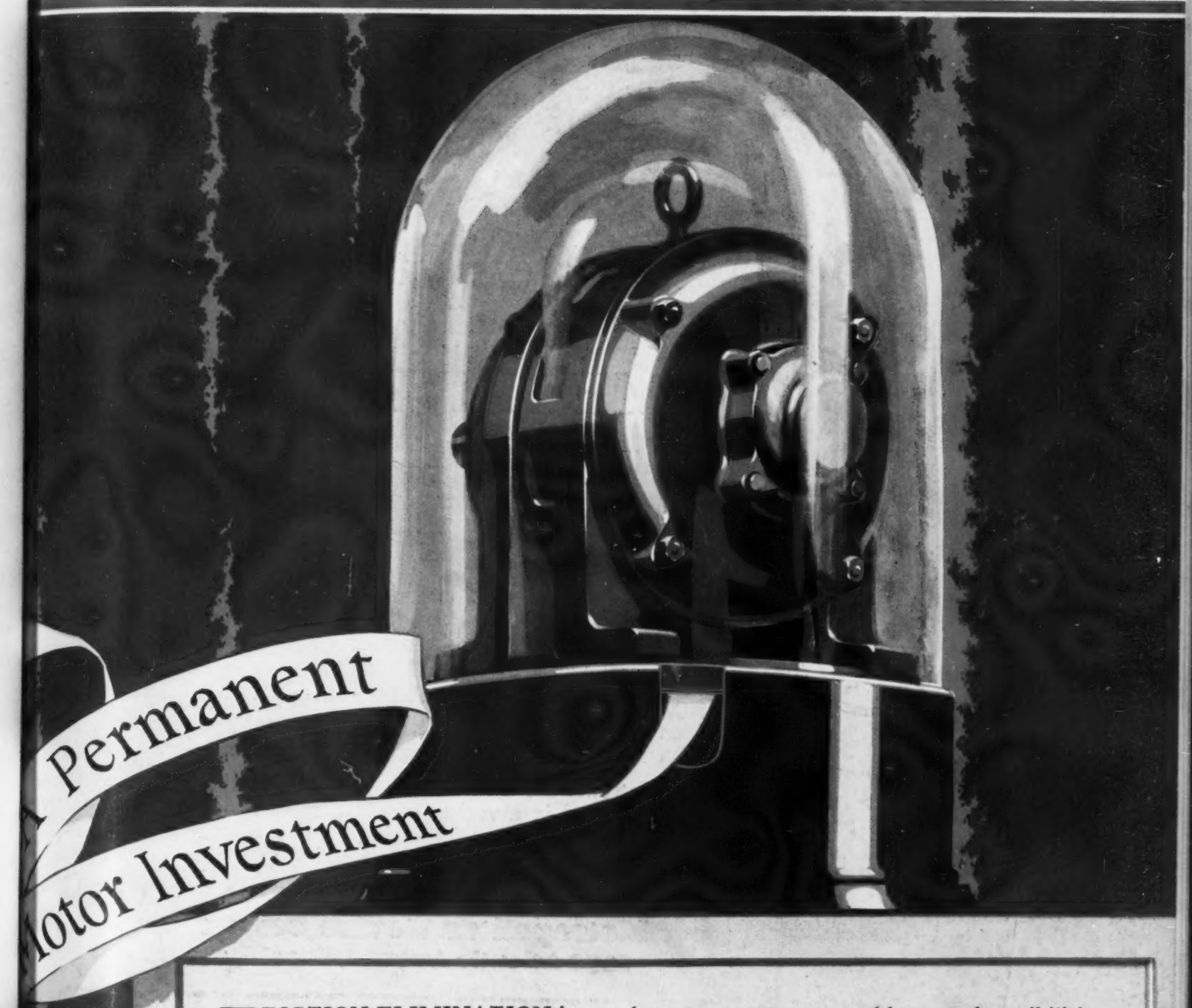

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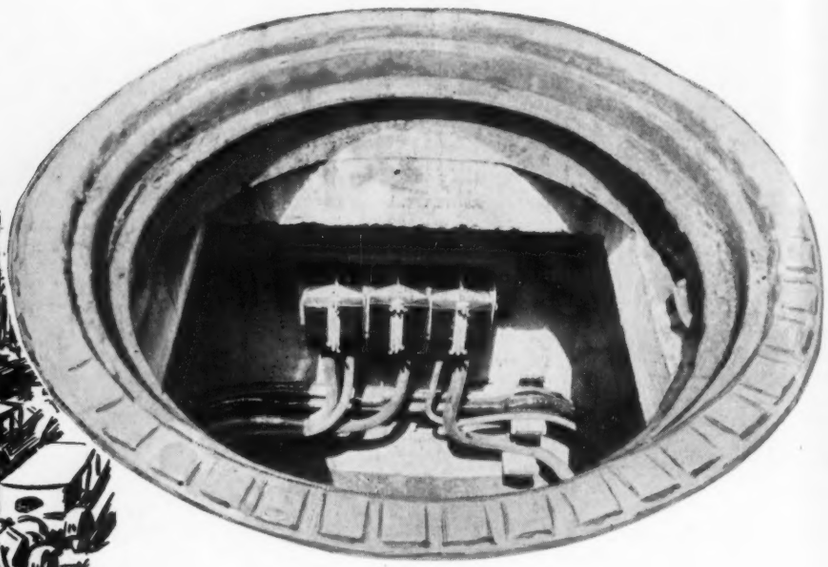

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Electrical World

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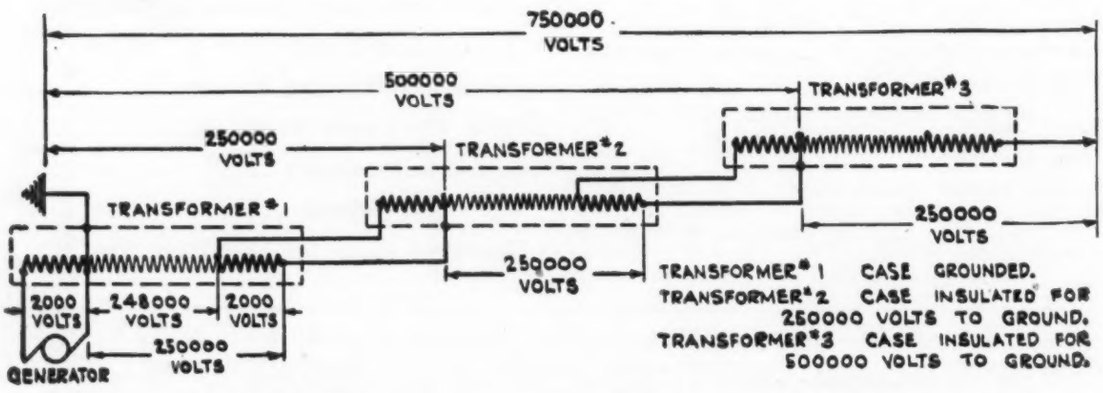

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Electrical World

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W. H. ONKEN, JR.
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VOLUME 89 — *New York, Saturday, March 19, 1927* — NUMBER 12

New York State's Water-Power Policy

THAT the water powers of New York are made the football of politics by both the Republicans and the Democrats is unfortunate. As an issue water power will not give strength to any campaign, because it fails to arouse popular interest in a state whose chief reliance for power is in coal. There is no magic that additional water-power development can work either in the factories or the homes of the state. Both now enjoy the benefits of hydro-electric development where it is feasible and economical, but except in the Niagara district electricity from coal is as cheap as if not cheaper than that generated from falling water.

However, in a larger sense it is a crime that water power susceptible of economical development should continue to run to waste in New York, and that the offers of private enterprise to develop it under safeguards set up by government itself should be spurned. Both the Governor and the Legislature of the Empire State have taken untenable stands in this matter, an attitude which ill becomes either, and were there any great public interest in the subject the reaction would be swift and salutary. There seem to be two bulls on the road leading to development, one a socialist and the other a reactionary, and while they disport themselves the road is effectually blocked. Governor Smith's pet schemes are just as illusionary as ever and apparently will suffer their usual fate—defeat. The Legislature is not one whit more constructive, so that New York will continue to burn tons and tons of coal while millions of water horsepower are wasted annually through legislative obstinacy.

Code Growth and Its Relation to Industry Trends

THE recent meeting of the electrical committee of the National Fire Protection Association again focuses attention on the National Electrical Code. For the first time in many years the committee has passed on to the industry many proposed changes which are deemed proper and desirable in order that they may have a field trial before their application is made mandatory. While temporarily this may have a deterring influence on code uniformity, the need of the industry for recommendation by the committee on such points as the motor-wiring tables has required that this action be taken. Naturally the question has arisen of how best to present the proposals which are to have field trials in the code.

Another point under consideration concerns the future provisions of the code concerning the number of lighting circuits in a given area. While the code covers a suitable and safe method of wiring within buildings and it is not its function to determine illumination intensities, yet it cannot so neglect the trend in the industry toward higher illumination intensities as to permit, with no ruling on the subject, unsafe wiring in the way of overloaded circuits, long drop cords and other breeding points of fire hazard. It is well known that this condition exists in many older wired buildings where conditions were quite satisfactory at the time of the original installation.

Of necessity the code must grow if it is to continue to occupy its position as a guide. It is also true that its usefulness will depend somewhat on keeping it simple and small in volume. Any attempt to add a series of notes to the code in order to introduce more material will breed confusion and create misunderstanding. Either a rule belongs in the code or it does not—there should be no half-way measures taken.

Regulation Is Not Management

FOR many years wide acceptance has been given to the theory that the regulation of public utilities by state commissions is not a managerial function. Tendencies toward the enlargement of the scope of commission jurisdiction have aroused doubts of the accuracy of this idea, and it is rapidly becoming evident that no hard and fast line can at present be drawn between these two activities. If power over rates, service and capital issues is not a phase of management, what is?

To some thinkers responsibility for the economic success of a power company defines the zone of management. Obviously, regulative commissions do not share this responsibility with utility executives. But the effect of commission decisions upon company prosperity and development is or may be so far-reaching that many other observers are coming to regard regulation as at least managerially potent. Commissions have long disclaimed managerial intentions, and by and large the power industry has been spared a good deal of interference of this sort. Thanks be; but the power to fix prices, to specify service requirements and to control the issue of capital is nothing short of final, barring appeal to the courts on constitutional grounds.

We may leave to the philosophers of the industry the further discussion of this question, pointing out meanwhile that whether regulation be clad in a managerial cloak or in a quasi-judicial gown, the problem of the utilities is so to conduct their business as to require a minimum of governmental supervision. The less recourse to the police power of the state, the better. Normally, rates and service ought to be determined by the utilities, with merely routine references to commission files. Rate revisions should be so clearly set forth to the public that whoever desires may receive explanations competent to satisfy reasonable beings, and petitions to state tribunals should be rare. Commission power to initiate rate proceedings may exist in a particular state, but this should seldom have to be exercised. Likewise with service, even unto the thorns of financing rural line extensions. As for capital issues, these may require commission judgment, but should infrequently reach the stage of controversy.

Regulation may or may not now be classed as man-

agement, but since "a rose by any other name would smell as sweet," it is "up to" the modern utility executive so to administer affairs that there will be the least possible need of governmental supervision. Certainly, it would be impossible for state commissions as at present organized successfully to carry on company business in the usual managerial sense, and to the credit of commissions the country over, ambitions of this kind are little in evidence. There is, none the less, an upward pressure in governmental circles toward the acquisition of greater regulative powers, and even the humblest utility employee should so do his work and so treat the public that the authorities will seldom deem it necessary to take the steering wheel of company management into their official hands.

Incentives to Insure Quality

MASS production is apt to stifle new developments and cause a standardization in the quality of product. To guard against these tendencies manufacturers give incentives to workmen to maintain quality, and they establish research and development departments which have no direct relations to production. Both the manufacturers and those who buy their products could, however, do more to insure quality in manufacture with profit to themselves and with benefit to the public.

Makers and users have a mutual economic interest in quality of product when they meet as sellers and as buyers. Price buying and selling reacts badly on both parties concerned in the negotiations and puts a damper on business developments of benefit to both. The day and way of David Harum in industry is past. Yet those who agree that buying purely on a price basis is bad policy are often the greatest offenders when a specific purchase is negotiated. The human liking for bargaining is difficult to control.

Whether it be a cable, an oil breaker, a transformer or a turbo-generator that is being sold, there is no question that the quality depends on the price or that poor quality to obtain a low price is false economy from the standpoint of both the buyer and the seller. Utility service, for example, is as strong as the weakest link in the equipment assembly, and a few dollars are well spent in order to insure quality. Likewise the reputation of manufacturers over a period of years hinges on the quality of their products. True economy for buyer and seller alike is attained when the best possible equipment is purchased at a fair price.

Competition and the need for business are the excuse of manufacturers for selling on a price basis. Budget allocations, the uninformed purchasing agent and the custom of the trade are excuses offered by purchasers to support price buying. Both buyer and seller deplore the practice, but neither offers a remedy. This remedy does not lie in price fixing. It lies in the development of accurate cost accounting by manufacturers, in their establishment of a sales policy and the development of sales data based on quality of product, and in the development of purchasing methods and personnel by the buyers, which insures buying for quality by men who know when prices are fair. The purchaser can develop checks to apply to bids and tests to apply to products which will serve to give an idea as to the fairness of the price and as to the quality of the product. With these checks as safeguards a policy of not dickering after bids are received can be adopted. The purchaser should encourage the manufacturer to make researches leading to new developments as a part of a purchasing policy.

Research programs should be expanded and the quality of the products improved, and the sales should be made in a manner to cover fair costs of this character. The purchasers should be helped to develop purchasing methods and to establish purchasing policies which recognize quality and a fair price as the governing elements. Such a program calls for time, team work and study, but the resultant benefits to industry and to the public are obvious.

Theft of Energy and Meter Cheating

NO COMPANY can afford to overlook the energy-theft and meter-cheating situation. This conviction was expressed emphatically at a recent meeting of the meter committee of the Southeastern Division of the N.E.L.A. One large light and power company that reported a special investigation covering 9,985 meters disclosed evidences of tampering in the case of 14.6 per cent. While this may be an extreme case of dishonesty among customers, it indicates the possible seriousness of the situation. Furthermore, a small percentage of thefts of energy as regards the number of cases may represent a large amount of revenue which cannot be collected.

In some territories the percentage accuracy of meters may become relatively unimportant when compared with the amount of energy lost by theft. It is not meant to belittle the need for accuracy of meters, to attain which a great deal of money has been justly spent, but utility companies may well spend also a little more to determine whether theft of energy is prevalent on their respective systems instead of reposing in what may be false security. This matter is considered so important by the company just mentioned that all its meter installations of any character are steel-clad with the exception of switchboard apparatus. Even on switchboards precautions are taken that will permit the quick discovery of dishonesty on the part of operators.

Metermen can profitably give thought to the construction and installation of meters in a manner that will prevent tampering without evidence of the interference being left behind. Careful consideration can also be given to selecting installation sites where company employees may make inspections and tests without difficulty.

Education as a Marketplace

THE recent investigation into engineering education has brought forth many facts and several recommendations. In a word it implies that there is little fault to be found with the mechanics of education or with the courses. A four-year rounded plan of education is outlined which it is expected will produce competent engineering material. But the survey and the conclusions accent concrete facts too strongly, and there is an element in the report, of which its authors are perhaps unconscious, seeming to indicate that the highest aim in education is to feed men into industry with the least resistance and with the most complete materialistic preparation.

In the true sense the art of education should mean the calling into action of the higher and nobler faculties of man solely for the joy that comes with their full functioning. An educated man should come to realize in his own experience the rare quality of high-minded-

ness that distinguishes the great in all ages. He should exercise the individual creative power which has been bestowed upon him and should seek education as a means of personal growth and culture. Young men in colleges should not get the viewpoint which belongs to the job hunters and credit mongers whose notion of value is formed by prices in the markets of the world. They should delight in the consciousness of knowing, find joy in the analytical processes of thought, thrill with the visions of truth, completeness and beauty found in science and literature, and contemplate a world perfected through imagination and warmed with the fire of emotion. They should dwell in the realm of human experience farthest removed from the beast.

Engineering is concerned with the amelioration of our industrial civilization. Engineers must apply their talents to supply the needs of industry, but their interests and efforts should not stop with material comfort. These things pertain to education, but there is room also for the development of the higher and finer qualities which make for full lives and complete states of being. The trappings and suits of engineering education should not be bought in whatever market suits their price.

Shaded and Controlled Light at the Exhibition of Equipment

AT THE national exhibition of lighting equipment recently held in Cleveland in connection with conventions of five associations representing fixture and glassware manufacturers, dealers, salesmen and contractor-dealers, there were noticeable some gratifying tendencies from the viewpoint of the advancement of the principles of proper and adequate lighting. An increasing number of fixtures displayed properly shaded and diffused light, even though for the most part they were shown without shades or shade holders. There were, too, conspicuous improvements in the form, coloring, finish and delicacy of glassware, particularly of smaller shades for multiple-light fixtures, and a variety of these improved products were on exhibition. The "appeal" of shades has been greatly increased in recent years. This trend has been evident to the close observer, but it has been so submerged by the overwhelming number of fixtures which are merely ornaments equipped with sockets that it has not been visible to most dealers and users.

The fixture manufacturer has often effectively defended his shadeless fixtures in past years by claiming that artistic shades are too costly or are unavailable. Until recently this defense has been more or less justified, but now it is evident that attractive shades can be produced. Lighting-equipment dealers interested in good lighting in the home will make more and more effort to shade and diffuse light. This is the inevitable goal, and central-station companies as well as lighting specialists are directing their attention—and in many cases their efforts—toward its attainment.

Introduction of the possibilities of modern controllable light has made a little progress in other directions, but it is only perceptible in a very few fixtures of the so-called artistic type. It, too, will continue to gain momentum, for the "period style" of the twentieth century will be fixtures of artistic merit which embody the possibilities of shaded, diffused and controllable light. The demands for good lighting will be supplied, with no slavish adherence to the art of another age of limited lighting possibilities. This is the opportunity and the duty of the fixture designer.

Impressions of the Commercial Section Meeting

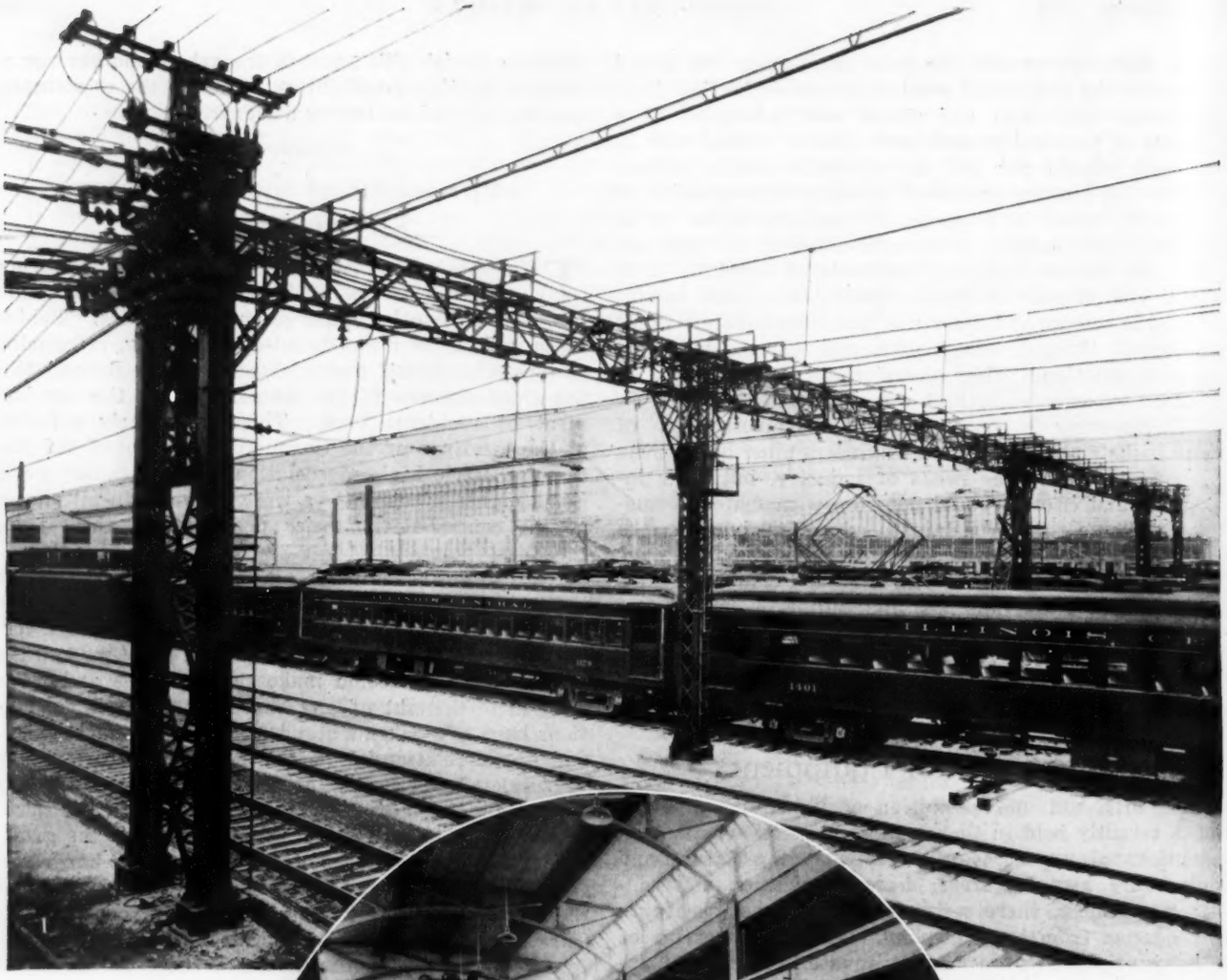
TWO things stand out above all else as the prime commercial issues of the power companies right now—trade relations and promotional rates. Behind these two major interests adequate wiring, refixturing and merchandising methods come next. Beyond this the chief concern of the moment is for the development of residence load. This was clearly reflected at the meetings of the Commercial Section of the National Electric Light Association in Chicago last week. Some eighteen committees were at work on all phases of the central-station sales problem, but these were the focal points.

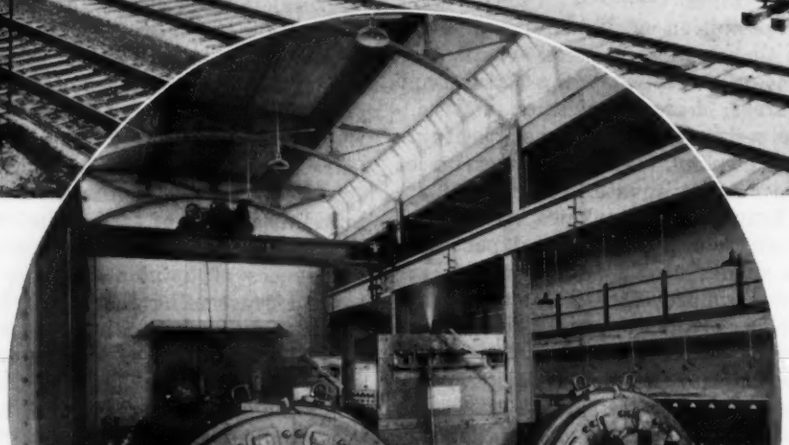
Realization is growing among the sales managers that the power industry can no longer go forward alone in splendid isolation as in the old days when engineering and operation were the compelling problems and the utility companies could make their policies and plans with little thought of any one else. The central stations have now taken a stand in the public marketplace, and their relationship with the manufacturers, the wholesalers and the other merchants who also serve this market are becoming steadily more extensive and intricate. This has been borne in upon them by the growing criticisms from the dealers, electrical hardware, furniture and department-store men who have raised their voices in protest against what they consider unfair competition. And so in Chicago last week a conference was called with leaders of these groups for a broad discussion of trade relations. It was an excellent example of the good that comes out of talking over differences of opinion. It was the first official move toward overcoming the "trade be damned" spirit that unwittingly has wrought much harm.

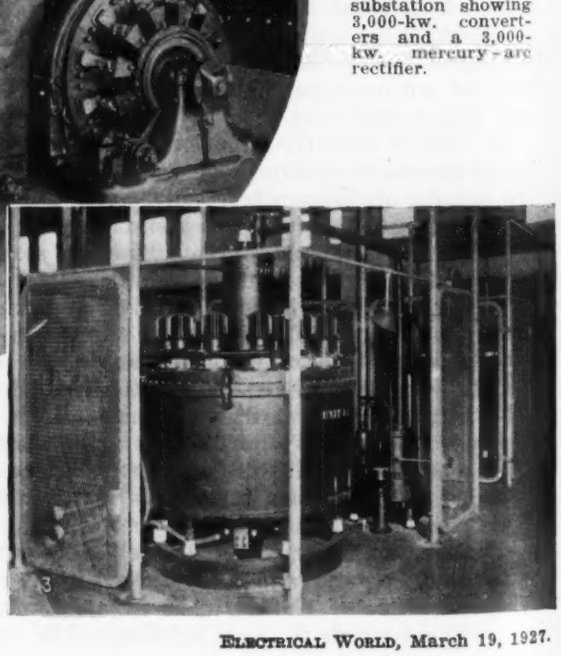
The work of the new committee on promotional rates is based on another fundamental. In every other manufacturing industry the sales manager has large influence and responsibility in setting the prices at which the product is to be sold. It has not been so in the power industry. Rates have evolved largely through the research and experiments of engineers who have had as their objective the arrangement of a tariff schedule that would provide a revenue. Rate making has been carried on in the spirit more of protection than of promotion. Yet, in order to do business, prices must be carefully balanced, to cover the cost—yes, but before all else to meet the conditions of the market and make the goods sell. A few central-station commercial executives today have the responsibility for rate making, but they are in the great minority. The Commercial Section has now realized the need, however, and gone to work on it.

Action was also taken to give leadership to two broad industry campaigns—one for more adequate wiring and one for refixturing. Both are fine signs of the awakened activity that has marked this season's administration of the Commercial Section. There was a large attendance at the meeting and a degree of confident and purposeful enthusiasm that has not been seen for years. Chairman Davidson is to be congratulated. The sales managers are forging ahead.

Electrified Section of the Illinois Central System at Chicago







No. 1. Storage tracks showing trolley-feed construction.

Nos. 2 and 3. Interior of railway substation showing 3,000-kw. converters and a 3,000-kw. mercury-arc rectifier.

THIS railroad electrification is an example of co-operation of independent elements to achieve a satisfactory result. Direct current at 1,500 volts is supplied by the Commonwealth Edison Company and the Public Service Company of Northern Illinois. In the construction work the two utilities built substations to deliver energy at the buses. The railroad, through its contractor, the Pierce Electric Company of Chicago, built the distribution and contact system.

Recent Developments in

Emergency Theater Lighting

By James M. Evans* and James McConahey†

EXTERIOR VIEW OF HOLLYWOOD PLAYHOUSE THEATER, WHERE STORAGE BATTERY RESERVE HAS BEEN INSTALLED FOR EMERGENCY SERVICE

FOR several years past and particularly during the past eighteen months the Boards of Fire Underwriters of the Pacific and certain California municipal electrical inspection departments have given special consideration to the development of an emergency theater-lighting system that would afford the highest possible degree of protection to the theater-going public. As a result of the co-operative effort of these bodies and interested manufacturers a system making use of a floating storage battery has been developed and recently installed in a Los Angeles theater that provides not only service for emergency lights for several hours but power for the operation of a projection machine or the stage lights for a period of from 30 minutes to an hour.

The floating storage battery system is one of five optional sources of emergency theater-lighting service permitted by the Board of Fire Underwriters of the Pacific and is one of only three services permitted by the department of building and safety of the city of Los Angeles. It is felt that the development of this system to its present high state of reliability will soon place it first in order of emergency services permitted. The 1926 regulations of the Board of Fire Underwriters of the Pacific permitted: (1) Separate serving company, (2) floating storage battery, (3) separate service from same company but from separate source, (4) separate service from same company but from separate feeder and (5) tap on street side of main service switch for very small theaters only. Recently the Department of Buildings and Safety of Los Angeles after much painstaking study and research and many conferences has further restricted the service to three, viz., (1) separate serving company, (2) floating storage battery and (3) gas.

The fact that service from a second company is a possibility in only a few cities and even where available is of questionable reliability, and in view of the many objectionable features to gas, included among which are introduction of an open flame into the theater with consequent fire hazard, possibility of asphyxiation. vitiation, explosion, etc., attention has therefore been focused upon the second method, namely, the floating storage battery. This system has passed the experimental stage and has reached such a high degree of de-

*Electrical engineer, Board of Fire Underwriters of the Pacific, Los Angeles, Cal.
†Electrical inspector, Department of Buildings and Safety, City of Los Angeles.

velopment that rules governing its installation have been formulated and are incorporated in the Underwriters Theater Regulations (1926), from which the following paragraph is quoted:

"Storage batteries floating on the line and having the capacity to carry all emergency circuits for eight hours are permitted if they are properly maintained. However, if approval has been obtained in advance

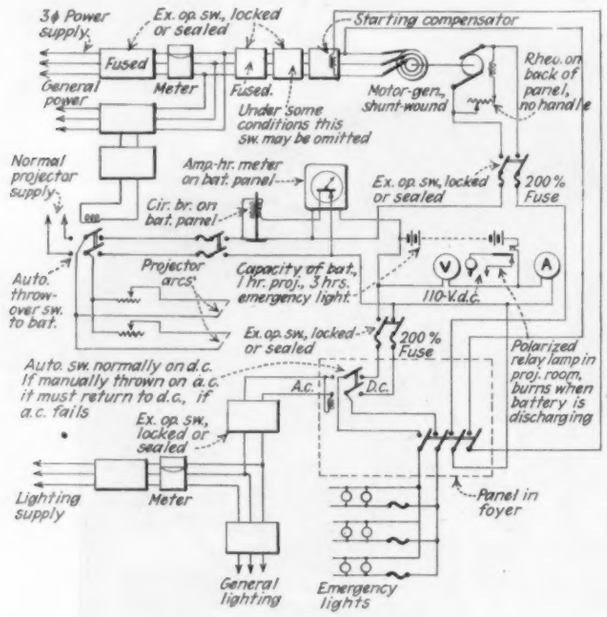

3φ Power supply
Ex. op. sw., locked or sealed
Starting compensator
Fused
Meter
Fused.
General power
Under some conditions this sw. may be omitted
Motor-gen., shunt-wound
Rheo. on back of panel, no handle
Normal projector supply
Amp-hr. meter on bat. panel
Ex. op. sw., locked or sealed
200% Fuse
Cir. br. on bat. panel
Projector arcs
Capacity of bat., 1 hr. proj., 3 hrs. emergency light
110-V.d.c.
Auto. throw-over sw. to bat.
Ex. op. sw., locked or sealed
200% Fuse
Polarized relay lamp in proj. room, burns when battery is discharging
Auto. sw. normally on d.c. If manually thrown on a.c. it must return to d.c., if a.c. fails
A.C.
D.C.
Ex. op. sw., locked or sealed
Lighting supply
Meter
Panel in foyer
General lighting
Emergency lights

FIG. 1—SCHEMATIC DIAGRAM OF THEATER EMERGENCY LIGHTING SYSTEM USING FLOATING STORAGE BATTERY

in writing, less capacity of batteries may be installed where a circuit is used having a double-throw switch in the foyer connecting the emergency lights to the general lighting system if the general lighting system is arranged to carry 100 per cent of the entire lighting load. Under this condition the main switch of the general lighting system shall be locked or sealed and fused to 150 per cent of the entire lighting load, and the generator shall have sufficient capacity to carry the entire emergency lighting load and, in addition, completely recharge storage battery in eight hours while carrying this load. Additional load may be put on this type of installation. Under no conditions shall this battery have less capacity than is necessary to carry emergency lights for two hours after automatically dropping the other load and without diminishing the lights in the auditorium below ¼ foot-candle at the end of the two-hour period."

A schematic diagram of the system as covered by this rule is shown in Fig. 1, and Fig. 2 is a circuit wiring diagram giving full details of its operation. Three of the newest and most modern theaters in Los Angeles have installed this system — Grauman's Hollywood Egyptian, the El Capitan, and now the Hollywood Playhouse, the latter being provided with the additional stage and projection reserve feature. Next to the safety and comfort of its patrons, the theater's first consideration is continuity of performance, whether on stage or by projection. Present-day stage lighting consists mainly of incandescent equipment at 110 volts backed now and then by direct-current arc spots, and up-to-date projection requires a generous supply of direct current at 90 volts. The electrical installation at the Hollywood Playhouse was designed and supervised by Claude D. Seaman, a consulting engineer of Los Angeles and a specialist in theater lighting. A brief description of how all the requirements of the new regulations were met, together with some new features not heretofore in evidence, will be given.

Floating Storage Battery System

The system consists of a 56-cell Exide storage battery, Westinghouse three-unit motor-generator set and Diamonds safety control apparatus. In accordance with standard practice the emergency and exit lighting system is distributed from a fuse panel (illustrated) in the box office entry in the front of the theater. The entire emergency lighting system is controlled by the switch handle shown, and small pilot jewels adjacent thereto indicate just how the system and equipment are functioning at any time. Closing this switch actuates the apparatus on the control panel in the generator room, shown in one of the accompanying illustrations, which in turn controls all functions of the system. The apparatus control panel is inclosed with glass doors fitted with a Yale lock. This prohibits tampering by unauthorized persons, as the only key is carried by the stage electrician. However, in an emergency the glass can be broken, giving instant access to the apparatus. Normally all hand-operated switches on this panel are closed and the doors locked.

Closure of the switch in the box office actuates the alternating-current relay on the control board, and the emergency system lights up immediately on alternating current. The automatic starter meantime starts the motor-generator set, and when the generator voltage is built up to the proper point, another series of relays permits it to come on the line. The battery, generator and lights are thus connected in parallel. Normally this condition prevails throughout the entire performance. At the end of the show the emergency lighting switch in the box office is opened and the reverse sequence of operations takes place. The generator, being operated at a slightly higher voltage than that of the battery, supplies the entire current for the emergency lights and in addition a small trickle charge current to the battery, automatically keeping it fully

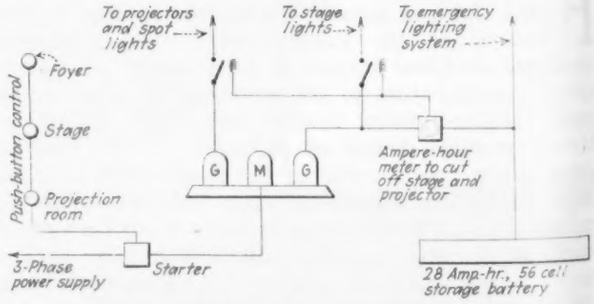


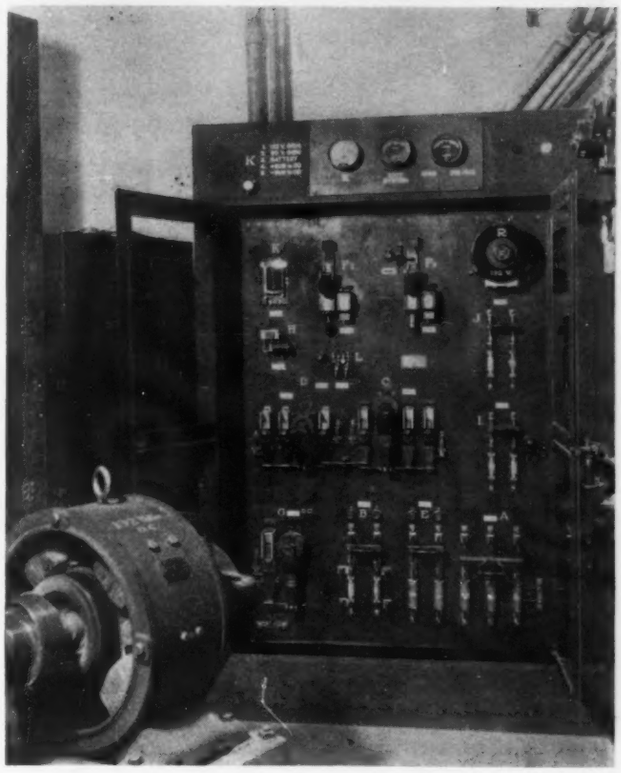
FIG. 2—THEATER EMERGENCY LIGHTING SYSTEM WITH STORAGE BATTERY RESERVE AS APPROVED BY THE BOARD OF FIRE UNDERWRITERS

charged. The spots and projector arcs are supplied by a 90-volt direct-current generator, which is on the same shaft as the emergency lighting motor-generator.

Now assume that a failure of the alternating-current power occurs during a performance. The emergency lights (exit, foyer, etc.) continue illuminated, being supplied with current directly from the battery without depending on the operation of any automatic switch.

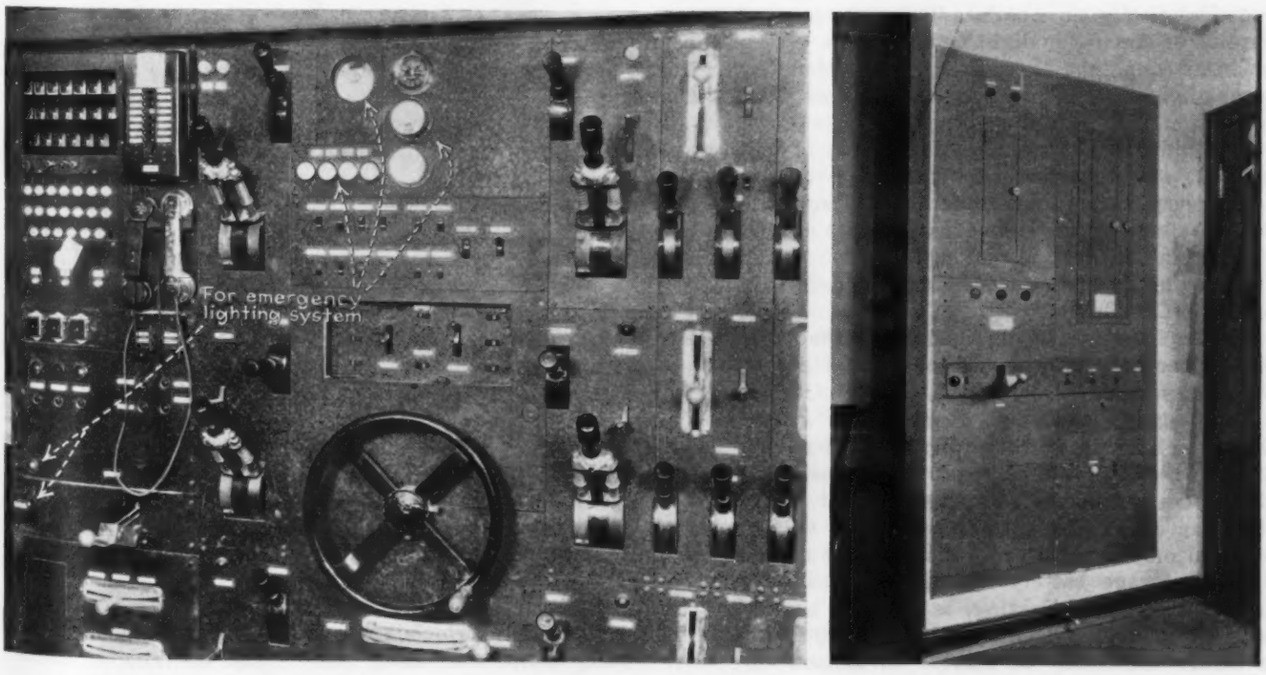
The generator, being shunt wound, now operates as a motor, being supplied with current from the battery, and thus drives the projector generator so that service from it is not interrupted. In order to prevent the battery from being overdischarged, in case of a prolonged interruption, to a point where it would not supply current for the emergency lighting circuits, an ampere-hour meter is placed in the discharge circuit, which opens a contactor at a predetermined point.

In normal operation should it become necessary for any reason to disconnect the battery from the generator or should the battery become disconnected from the system through broken connections, open switch, burned-out fuse, etc., red pilot lights on the main theater switchboard will immediately call the electrician's attention to the fact, but the emergency system will continue to function, being supplied directly from the generator. Should the generator now fail for any reason, the emergency system will automatically be transferred to the alternating-current supply, and should the alternating-current supply now fail, the system will automatically be transferred back to the battery mains for such service as may remain. The first service to resume will, however, pick up and maintain the system until resumption of normal operation. A battery of reasonable size can supply the new low intensity arcs for five hours with enough reserve to take care of the emergency lights for an additional period of two hours. In addition the 110-volt direct-current mains go direct to the stage switchboard to provide "stand-by" service for the stage lights on failure of alternating-current service.



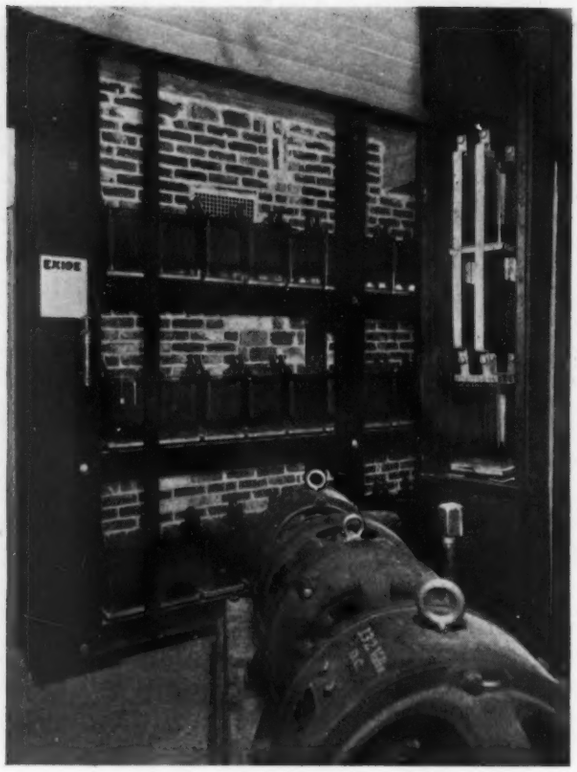
EMERGENCY LIGHTING CONTROL PANEL CONTAINING CONTACTORS, RELAYS, ETC.

In this installation the stage electrician has direct charge of the entire equipment, and one of the accompanying illustrations shows a corner of the "Safety Controlite" stage switchboard, on which is located the supervisory apparatus for his benefit. Beside the ampere-hour meter in a locked compartment are a voltmeter and ammeter (showing charge and discharge) and four pilot jewels, which show the condition of the system at all times. Should the stage electrician desire to use the 90-volt projection circuit for his spotlights, he can operate the motor-generator set as a strictly motion picture set independent of the emergency system, the battery generator simply running idle until the emergency control is energized. The projection



AT LEFT—MAIN THEATER SWITCHBOARD, SHOWING THE SMALL SPACE TAKEN UP ON THE BOARD BY THE EMERGENCY LIGHTING SYSTEM. AT RIGHT—EMERGENCY LIGHTING CONTROL LOCATED IN BOX OFFICE

Only the large switch with projecting handle and the four near-by pilot lights shown in the right-hand view are concerned in the emergency lighting system



THREE-UNIT MOTOR-GENERATOR SET AND PART OF THE 56-CELL, 280-AMP.-HR. STORAGE BATTERY

room is provided with a similar and duplicate control and the set may be kept operating from either point after the emergency system is turned off. The projection room panel is also equipped with the usual field rheostat, voltmeters, ammeters, etc., common to installations of this kind.

Among the many advantages of the system as interpreted and developed in this particular installation are:

1. Practically an absolute guarantee against interruption of emergency lighting service.
2. An equal guarantee of uninterrupted service for stage lighting and projection purposes (box office protection).
3. Elimination of needless duplication of motive and generative apparatus and equipment.
4. Concentration, under one head, of supervision and care of all apparatus and equipment.
5. Saving in first cost of equipment.
6. Saving in maintenance—that is, current cost, depreciation and labor.
7. Simplification of the system to the point where it is apparently as nearly absolutely foolproof as it is humanly possible to make it.

Maintenance is a small item, as the system is designed to keep the battery fully charged automatically, so that the actual care required is small. Batteries of any desired capacity can be supplied in the sealed glass jar construction, so that refilling with water is required only once in every six to eight months. The floating storage battery system, except as applied to theater emergency lighting, is not new and is not an experiment, such systems having been used for years to insure continuity of service on Edison three-wire direct-current networks, and for the operation of oil circuit breakers, etc.

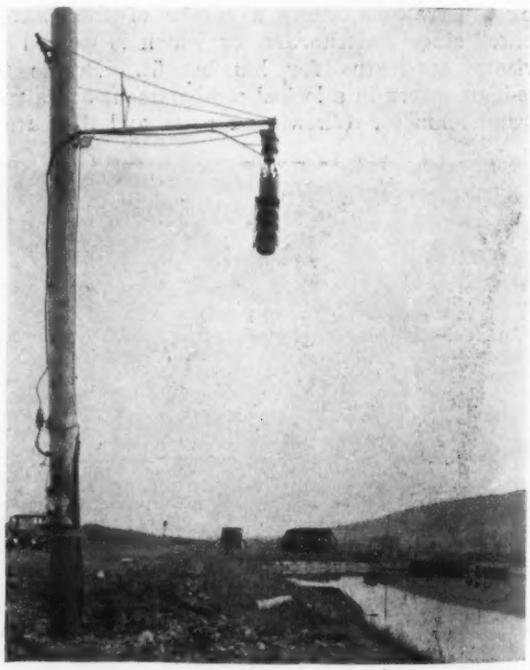
Grateful acknowledgment is made to Boerner & Swindell, local engineers of the Electric Storage Battery Company, for their co-operation and assistance in the development of this system; also to Harry Easterbrook, of the Westinghouse Electric & Manufacturing Company; to E. G. Sheibley, chief engineer of the California Industrial Accident Commission, and particularly to Mr. Seaman for the execution of the plan.

Electric Lights to Guide Canal Navigation

KEROSENE buoy lights have never been displaced by electric until recently on the New York State Barge Canal because of the difficulty of securing and serving a flashing mechanism that would properly mark the channel and be inexpensive to build, install and operate. Engineers of the Westinghouse Electric & Manufacturing Company, working in collaboration with F. R. Lindsey, electrical inspector for the Bureau of Canals, have developed an electric flasher system and a lantern of new design that appears to solve the problem.

Among the advantages claimed for the new system, in addition to reliability, is that the construction of the lantern is such that the heat from the burning lamp will keep it free from frost, snow and ice. The electric lantern, which is supported 25 ft. above the water level, where it will be free from damage by ice, flood water or boats drifting out of the channel's course, can be seen at a considerable distance and cannot be easily hidden by fogs or river mists.

The electric flashers are constructed so that the light can be flashed with an equal period of light and dark, it being possible to vary the cycle from ten seconds to two minutes as desired. As a precaution against interruption of service, an emergency lamp is provided in each lantern which automatically cuts in should the other lamp fail. Each lantern also contains an automatic cut-out so that other lights on the series system are not extinguished in case both lamps in any lantern burn out, or the lantern itself is destroyed.



FLASHING ELECTRIC SIGNAL SUPPLANTS KEROSENE LAMPS FOR GUIDING NAVIGATION ON NEW YORK BARGE CANAL

Railroad Executive Discusses Electrification

Factors Influencing — Probable Trend — Must Show Fair Return on Investment— Attitude on Purchased Versus Generated Power and Indirect Effect of Trunk-Line Electrification

An Interview with

C. H. Markham
Chairman of the Board, Illinois Central System

C. H. MARKHAM

MORE often than not it pays a person to lay aside, temporarily, what he thinks of a certain situation, when the desired progress is not being made, and find out what some one else thinks of it. It is not uncommon to seek the viewpoints of others in similar occupations, but it takes a broad-minded individual to solicit the viewpoints of some one "on the other side of the fence." This is particularly true if it is expected that the person consulted may have the opposite viewpoint from that of the consultor. However, such views usually enable a person to terminate wrong procedure in solving problems and "start on a new tack" that will be more effective.

What do the persons who "hold the pursestrings" of railroads think of electrification, and what evidence do they have to receive before they will share the enthusiastic opinion of the electrical industry? Such opinions give the key to what the electrical industry must do if the day of railroad electrification is to be advanced.

Because the Illinois Central Railroad is electrifying its Chicago terminal it might be thought that C. H. Markham's opinions of electrification would be prejudiced in favor of electrification, but an interview with him indicates that he has about the same attitude that other railroad executives might be expected to have. Consequently his opinions should be of value to utilities and electrical manufacturers.

When first apprised of the subject on which his viewpoints were wanted, Mr. Markham emphasized that he could not speak for all railroads, but when asked for views based on the experience of his own railroad, he explained the early history that led to the electrification of the Illinois Central Chicago terminal.

FACTORS INFLUENCING RAILROAD ELECTRIFICATION

"Electrification was the ultimate result of our physical relation to the city," Mr. Markham declared. He referred to the early days when to gain an entry to the center of the city (then with only 30,000 inhabitants) it was imperative for the railroad company to approach by the lake front and protect the shore line by constructing a bulkhead or timber wall to prevent erosion by waves, as the city could not afford to do this. It was also necessary to depress the tracks to preserve the appearance of Grant Park and Michigan Boulevard. In more recent years objections to smoke from South Shore residents, the moving of the Field Museum from its South Side location to its present site (made possible by exchange of rights), plans to make the Illinois Central terminal common to several railroads and general improvement of Chicago's lakefront and downtown appearance were other factors influencing electrification. The railroad's privilege to maintain its physical relation to the city was also premised, several years ago, on its promise to electrify, in the order named, its suburban trains, freight trains and finally through passenger trains. Only the first of these will be electrified in the present undertaking.

"Relative economy of operation of steam and electric trains was not the deciding factor in this instance," declared Mr. Markham, "although the cost naturally had to be considered. Furthermore, I believe all steam railroad electrification in this country so far has been determined by some other factor. For example, the Grand Central Terminal in New York involved a similar problem in that it was at the heart of a great city and served dense traffic. To compete with the New York Central Railroad, the Pennsylvania Railroad had to have a central terminal and enter by the Hudson tunnels, both of which required electrification of this road and others now entering its terminal.

"The Philadelphia terminal, I believe," Mr. Markham continued, "was electrified because of the need of increased traffic facilities. Electrification made possible the accommodation of a much larger terminal traffic than was possible under steam operation. Again, with the Chicago, Milwaukee & St. Paul Railroad traffic reached the maximum limit of train operation under

steam. Electric operation made possible an increase in the train loading, thereby reducing the cost of operation. With the Norfolk & Western Railroad, both steep grades and congested traffic dictated electrification to avoid increasing trackage.

"I do not believe that any railroad has electrified or is considering electrification because of the relative operating economy of steam and electric trains," Mr. Markham added.

Future Electrification

"Based on what you have said, is it wrong to conclude," Mr. Markham was asked, "that further electrification of steam railroads will be employed in the near future chiefly for congested terminals (particularly in the hearts of large cities), for operation through long tunnels or on heavily traveled trunk lines which, because of grades or existing traffic facilities, cannot continue to handle increased traffic without increasing trackage or using electric operation?"

"Stated briefly," Mr. Markham replied, "probably your conclusion is about correct, although a person has to be a prophet to know how future economic conditions may affect future decisions."

Questioned as to whether the cost of electrifying steam railroads and attracting the necessary capital are more of an obstacle to electrification than any doubt regarding relative performance of steam and electric equipment, Mr. Markham replied:

"I have never had any difficulty in securing the approval of our board of directors to spend money for meritorious purposes such as increasing safety or traffic facilities. No difficulty is ever experienced in raising capital if its expenditure can be shown to offer a fair return to the investor. The majority of the public is fair enough to allow a fair return if it is apprised of the necessity of doing so to attract capital that will give it the service desired. Such education must be continued and based on facts, and the confidence thereby obtained must be preserved by living up to promises made."

Value of Overbuilding Rights

"Isn't it possible that the value of overbuilding rights, permitted by the electrification of terminals (especially in the hearts of large cities or along routes near a residential section), will partly and sometimes largely offset the cost of such electrification?" Mr. Markham was asked.

"In the case of the Grand Central Terminal electrification," Mr. Markham explained, "overbuilding of tracks was made possible that developed probably the highest class apartment house district in New York. What relation this created real estate value bears to the cost of the electrification I do not know. Here in Chicago just north of this building [pointing to the trackage from Chicago River to Randolph Street], overbuilding of the tracks would create real estate valued at 40 per cent of the entire Loop district of Chicago. South of here along the lakefront overbuilding would create miles of valuable real estate for, possibly, high-class apartments overlooking Lake Michigan. Adjacent land value would also be increased thereby."

"What is the maximum limit to fixed and operating charges per ton-mile of traffic below which these unit expenses will have to fall before railroads will consider electrification?" Mr. Markham was asked, and to which he replied:

"I do not know; each company will have to figure them out for its specific road and specific conditions. As stated before, however, other factors not reflected by such a factor will have to be considered."

Purchased Versus Generated Power

Opinion on purchased power versus generated power was solicited by the question: "If electrification is adopted by any railroad for any section, should that railroad load itself with the capital expenditure for generating plants, transmission lines and substations, and further complicate the already complex problems of transportation, if power can be purchased at a reasonable figure?"

Mr. Markham replied: "In our case we figured the cost of power both ways and found that we could buy electric service* from the Commonwealth Edison Company more cheaply than we could make it. And it should be expected that a utility company of this size would be able to sell energy more cheaply than any single user can generate it. Answering your question more specifically, I would hesitate to add the complexity of a generating and distribution plant with its organization to our transportation problems (although we now generate power in a small way for shops) unless there were a sufficient differential between the unit price of purchased power and the total unit fixed and operating expenses per kilowatt-hour of privately generated power."

To check the belief of some persons in the electrical industry, Mr. Markham was asked if it might not be possible that railroad traffic would be increased and thereby help to justify trunk-line electrification, if utility-owned power lines paralled railroads to serve trunk-line electrification and also the stopping points with more reliable and cheaper energy than they could secure from local isolated plants (this possibility being premised on the past commercial and industrial growth of towns with reliable cheap power also having good railroad facilities).

Mr. Markham said: "My experience would not enable me to answer this query, because utilities already serve virtually all the station stops on the Illinois Central Railroad. Possibly the combination of railroad facilities and cheap reliable power, made possible by such a line as you suggest, would help the commercial and industrial growth of some communities in some sections of the country not already having such service and thereby increase railroad traffic. But it is very doubtful whether this particular effect alone would ever offset the cost of trunk electrification."

Sidney Withington Talks on Electrification

LACK of information upon which to base the adoption of a single system of electrification which would be standard for all railroads in this country is probably the chief obstacle to the wider acceptance of electric traction, according to an address made recently before the Affiliated Technical Societies of Boston by Sidney Withington, electrical engineer New York, New Haven & Hartford Railroad. The speaker said that the Diesel engine may change the entire problem of economical railroad operation on account of its high thermal efficiency. It is a very promising form of motive power, he said, but not enough is known of its performance under operating conditions.

*See Illinois Central Railroad contract for purchased power, ELECTRICAL WORLD, page 98, Jan. 10, 1925.

Power Losses in Commercial Glasses

Electrical Behavior of Various Commercial Glasses Explained on Basis of Their Chemical Compositions—Effect of Temperature Changes on Flint and Pyrex Also Investigated

By William C. Decker
Harvard University

THE dielectric constants, phase differences and power losses of eleven commercial types of glass have been investigated with a view toward explaining the behavior of these glasses on the basis of their chemical compositions. In addition the effect of temperature changes on the capacitance and conductance of flint and Pyrex glasses was investigated between 25 and 100 deg. F. With the exception of three glasses their chemical compositions are given in Table I.

The four different chemical types of glasses examined were found to possess distinct electrical properties and can be ranked as follows on the basis of least power loss:

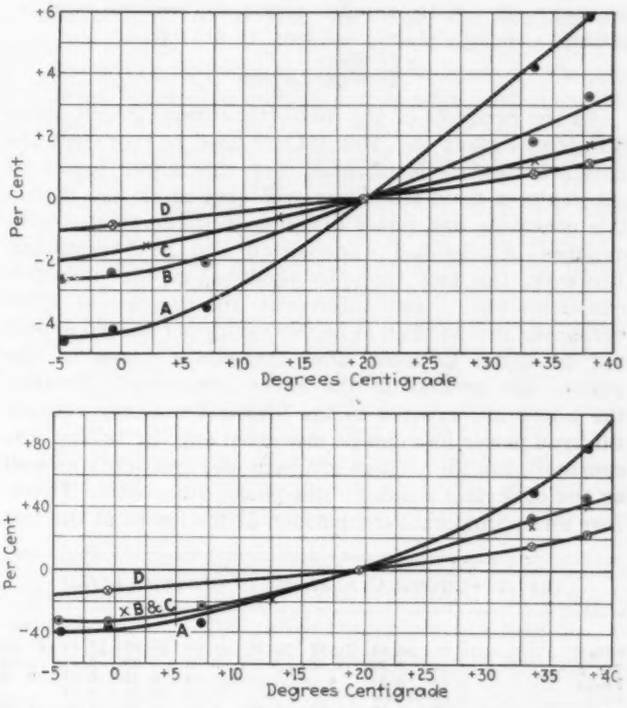
1. Borosilicates containing no heavy metals and but a small amount of alkali.
2. Soda-lead borosilicates.
3. Soda-lead silicates.
4. Soda-lime silicates.

At 1,000 and 30,000 cycles per second, Pyrex B was found to have the minimum power loss. Besides, it has a small temperature coefficient of capacitance and conductance and is therefore especially useful for purposes where it is necessary to avoid changes in capacitance and conductance with changes in temperature.

As Table II indicates, a high degree of consistency was obtained in the values of the dielectric constants for different samples of Pyrex A and Pyrex B, the maximum deviation of any individual value of the dielectric constant from the average value of four samples being only 0.6 per cent. However, the individual values of phase difference varied quite considerably. These variations resulted probably from the presence of varying numbers of minute air bubbles between the glass samples and the mercury electrode used in testing, although precautions were taken to minimize this error. If metallic coatings had been employed as electrodes, it is clear that this source of error would have been eliminated. However, the expense of preparing the samples for measurement in this manner was not justified by the objects of the investigation.

It will also be noted from Table II that wider variations occur in the values of phase difference at 1,000 cycles per second than at 30,000 cycles per second. The greater inconsistencies at the lower frequency are probably due to the fact that the conductances being measured in this case are of very small order of magnitude.

Considering the eleven commercial glasses studied, the dielectric constants vary in value from 4.7 to 8.7 at 1,000 cycles per second and from 4.7 to 7.9 at 30,000 cycles per second. This variation is attributed mainly to differences in the compositions of the glasses, as the results which were obtained on annealed (No. 6) and unannealed (No. 5) samples of the same glass show



FIGS. 1 AND 2—PER CENT CHANGES IN CAPACITANCE (ABOVE) AND CONDUCTANCE WITH TEMPERATURE (BELOW)

A—White flint glass (No. 3) at 1,000 cycles per second.
B—White flint glass (No. 3) at 30,000 cycles per second.
C—Pyrex glass (No. 10) at 1,000 cycles per second.
D—Pyrex glass (No. 10) at 30,000 cycles per second.

that different heat-treatments have a relatively small influence on the values of the dielectric constant.

The soda-lead glasses have smaller dielectric constants than the soda-lime glasses. The dielectric constant of the borosilicate of lead and soda is less than those of the silicates of lead and soda. The absence of heavy metals and large amounts of alkalis from a borosilicate, as in the Pyrex glasses, lowers the dielectric constant to a minimum for the eleven glasses tested.

The dielectric constants of all the glasses show a decrease when the frequency is raised from 1,000 to 30,000 cycles per second. The amount of this decrease is dependent on the phase difference. Glasses having a large phase difference show the greatest change in dielectric constant with frequency. As would be expected, this change is especially marked in the case of glass No. 1, which has an unusually large phase difference.

PHASE DIFFERENCES

The phase differences correspond in general to the dielectric constants—that is, the glasses having high dielectric constants also possess large phase differences. An exception to this generalization is glass No. 7, which

has a moderately high dielectric constant but an unusually small phase difference. A high alkali content, as in glass No. 1, will produce a glass having a large phase difference, whereas the effect of heavy metals such as lead is to produce a glass having a small phase difference. However, the absence of heavy metals and large quantities of alkalis in the Pyrex glasses produces glasses having uniformly small phase differences. As noted for the dielectric constants, the influence of annealing on the phase difference of glass No. 5 is relatively slight.

In the case of glasses that show large phase differences a considerable decrease with increasing frequency is observed. With smaller phase differences this decrease, although plainly evident, is not large.

Power Losses

As the products of the dielectric constants and phase differences given in Table III are used to represent the power losses,[1] it is obvious that the power losses of glasses at a fixed frequency will vary as do the dielectric constants and phase differences of the glasses with changes in chemical composition and heat-treatment. However, the fact that the products of the dielectric constants and phase differences are greater at 1,000 cycles per second than at 30,000 cycles per second should not be taken to mean that the power losses of the glasses are greater at the lower frequency. Actually the losses are greater at the higher frequency because the true power loss can be measured only by taking into consideration the voltage gradient and frequency as well as the dielectric constant and phase difference. Therefore an approximate comparison of the losses at the two frequencies can be obtained by multiplying the products at 30,000 cycles per second by the frequency ratio 30, as the voltage gradient was the same for both frequencies. The products given in the tables serve merely as indices of the power losses at the same frequency.

Since the power loss is the best criterion in selecting a glass for electrical purposes, the results show that glass No. 11 is superior to the other glasses tested, whereas glass No. 1 is extremely poor, as would be expected, because it is a soda-lime glass of high alkali content.

TABLE I—CHEMICAL ANALYSIS OF GLASSES TESTED

	1	2	3	4	7	8	9	10
SiO_2	69.93	69.40	72.78	72.21	64.64	65.47	72.05	81.00
Al_2O_3	1.54	0.78	1.40†	3.55†	0.20	2.99	2.21	2.00
Fe_2O_3	0.19	0.14	.....	.....	0.04	0.51	0.05	0.10
PbO	1.44	Trace	.....	.....	21.66	20.20	6.11	.....
CaO	3.17	5.15	5.32	7.08	0.02	0.22	0.06	0.28
MgO	0.03	4.09	3.97	0.42	0.02	0.13	0.09	.....
Na_2O	21.02	16.67	16.72	16.75	9.10	6.40	4.23	4.20
K_2O	0.10	0.20	.....	.....	3.20	3.59	1.12	.....
P_2O_5	0.08	0.16	.....	.....	0.75	Trace	Trace	.....
Sb_2O_3	0.05	0.10	.....	.....	.....	.....	.....	.....
As_2O_3	.....	.....	.....	.....	.....	.....	.....	0.35
MnO_2	0.09	0.19	.....	.....	.....	0.07	0.01	.....
F_2	.....	.....	.....	.....	Trace	.....	Trace	.....
B_2O_3	2.36*	3.12*	.....	.....	0.37*	.....	14.07*	12.00
SO_3	.....	.....	.....	.....	.....	0.01	.....	.....
BaO	.....	.....	.....	.....	.....	Trace	.....	.....

*By difference. †Fe_2O_3 included.

Glasses Nos. 1, 2, 3 and 4 are soda-lime glasses. Nos. 3 and 4, which are commonly used in the manufacture of insulators used on telephone and telegraph lines, are known commercially as white and green flint, respectively. Samples Nos. 7 and 8 are soda-lead glasses, No. 9 is a borosilicate of soda and lead, and No. 10 (commercial Pyrex) is a very acid sodium, aluminum borosilicate containing some arsenic. The complete chemical compositions of glasses Nos. 5, 6 and 11 were unavailable. Nos. 5 and 6, which are soda-lime glasses containing about 3 per cent alumina, 7 per cent lime and 13 per cent soda, are identical except that the latter glass has been annealed at 620 deg. C. Glass No. 11, designated by its manufacturer as Pyrex B, is a slight modification of commercial Pyrex or Pyrex A. The former is a trifle softer under the flame than the latter to the extent of approximately 35 deg. C.

TABLE II—THE DIELECTRIC CONSTANTS, PHASE DIFFERENCES AND THEIR PRODUCTS OF PYREX GLASSES

Material	Sample No.	1,000 Cycles Per Second—Di-electric Constant	1,000 Cycles Per Second—Phase Difference (Deg.)	1,000 Cycles Per Second—Product	30,000 Cycles Per Second—Di-electric Constant	30,000 Cycles Per Second—Phase Difference (Deg.)	30,000 Cycles Per Second—Product
Glass —	1	4.86	0.50	2.43	4.83	0.35	1.69
No. 10 —	2	4.90	0.43	2.11	4.83	0.32	1.55
(Pyrex A)—	3	4.89	0.45	2.20	4.83	0.32	1.55
	4	4.89	0.48	2.35	4.82	0.30	1.45
Average		4.89	0.47	2.27	4.83	0.32	1.56
Glass —	1	4.74	0.20	.95	4.70	0.15	0.70
No. 11 —	2	4.70	0.28	1.32	4.66	0.16	0.75
(Pyrex B)—	3	4.72	0.37	1.75	4.68	0.15	0.70
	4	4.75	0.27	1.28	4.72	0.14	0.66
Average		4.73	0.28	1.32	4.69	0.15	0.70

TABLE III—DIELECTRIC CONSTANTS, PHASE DIFFERENCES AND THEIR PRODUCTS FOR ELEVEN COMMERCIAL GLASSES

Sample No.	Description*	1,000 Cycles Per Second—Dielectric Constant	1,000 Cycles Per Second—Phase Difference (Deg.)	1,000 Cycles Per Second—Product	30,000 Cycles Per Second—Dielectric Constant	30,000 Cycles Per Second—Phase Difference (Deg.)	30,000 Cycles Per Second—Product
1	21 per cent soda, 3 per cent lime	8.7	4.2	36.5	7.9	1.7	13.4
2	17 per cent soda, 5 per cent lime	8.2	1.6	13.1	7.9	0.7	5.5
3	17 per cent soda, 5 per cent lime	8.0	1.0	8.0	7.8	0.6	4.7
4	17 per cent soda, 7 per cent lime	8.2	1.4	11.5	7.9	1.0	7.9
5	13 per cent soda, 7 per cent lime	8.1	1.3	10.5	7.8	0.7	5.5
6	No. 5 annealed	8.0	0.9	7.2	7.8	0.7	5.5
7	9 per cent soda, 22 per cent lead	6.8	0.27	1.84	6.7	0.20	1.34
8	6 per cent soda, 20 per cent lead	7.2	0.9	6.5	7.0	0.5	3.5
9	Borosilicate of soda and lead	5.2	0.37	1.92	5.1	0.33	1.68
10	Pyrex A	4.9	0.47	2.27	4.8	0.32	1.54
11	Pyrex B	4.7	0.28	1.32	4.7	0.15	0.70

*See Table I for complete chemical analyses of all glasses except Nos. 5, 6 and 11.

Effect of Temperature

The difference in the behavior of white flint glass (No. 3) and Pyrex glass (No. 10) as regards capacitance and conductance at various temperatures can be seen from Figs. 1 and 2, in which curves are plotted showing the percentage changes in capacitance and conductance from their values at room temperature (19.6 deg. C.) as the temperature is raised or lowered. In Fig. 2 the same curve (*B* and *C*) represents the conductance changes in Pyrex at 1,000 cycles per second and in flint at 30,000 cycles per second, as the changes for these two cases are practically identical. Because of the smaller changes in Pyrex with temperature, fewer observations were made at the lower temperatures on account of the difficulties encountered because of condensation of moisture, which was not entirely prevented by the use of a layer of oil, as described below. These errors in the case of flint glass, on the other hand, are negligible because of the relatively large changes in electrical properties of this glass with temperature.

It will be observed that Pyrex has low temperature coefficients of capacitance and conductance compared with flint. The coefficients for both glasses are greater at 1,000 cycles per second than at 30,000 cycles per second. The rates of change with increasing temperature are more pronounced at the higher than at the lower temperatures, except capacitance changes in Pyrex, which increases in a practically linear relation.

Method of Testing

A vacuum-tube oscillator with an output of stable frequency and practically pure sine-wave form was used as the source of test voltage. The frequencies used were 1,000 cycles per second to represent the audio range, and 30,000 cycles per second to typify the carrier band.

[1] Hoch, *Bell System Technical Journal*, Vol. 1, page 111 (1922).

The capacitance and the conductance of the samples were measured by a capacitance and conductance bridge. The bridge air condensers had been calibrated previously to the measurements by comparison with standard condensers calibrated by the Bureau of Standards.

Although, for reasons to be discussed later, it is more desirable to have all the samples in the form of tubes sealed at one end, it was possible to obtain only some of the samples in this form, the remainder being in the form of plates. The plates were about 16 cm. square and varied in thickness from 0.39 to 0.52 cm. The tubes were about 30 cm. in length, 1.5 cm. in diameter and of wall thickness between 0.27 and 0.41 cm.

TUBE AND PLATE SAMPLES

In preparing a sample in the form of a plate for measurement, a condenser was made by floating the plate on a pool of mercury, which forms the lower electrode of the condenser, and then filling with mercury a brass ring placed on top of the plate to form the upper electrode. Mercury is used to secure intimate contact at all points of the sample, thus minimizing errors due to air spaces between the electrodes and the samples. However, an error is introduced due to the spreading out of the electric field beyond the edges of the upper electrode, since this electrode is necessarily smaller than the lower electrode. This error has been corrected for in the manner described by Hoch.[2]

The tubes, which were sealed at one end, were prepared for measurement by mounting them in a bath containing a saturated solution of sodium chloride and then filling the tubes with mercury to a definite height. The salt solution was used for the outside electrode because it could be more conveniently heated, cooled and stirred than mercury for the measurements at other than room temperature, whereas its resistance is sufficiently low that the measured values of conductance are not increased due to the series resistance of the solution. It is more desirable to have the samples in the form of tubes, as stated previously, because no edge correction is necessary if the perimeter of the inside electrode is small compared with its length. When this condition is fulfilled (as was the case with these samples), the edge correction, which for any condenser of this type depends on the ratio of the length of the edges of the smaller electrode to the area of this electrode, will be negligible.

Before measuring the changes due to temperature, all the tubes except those of flint and Pyrex glass were removed from the bath. Light mineral oil was then poured on top of the mercury electrodes of the tubes in the bath to form a layer of approximately 2 cm. in depth. The oil was used to prevent condensation of moisture on the walls of the tubes upon cooling, which would otherwise introduce errors into the capacitance values by increasing the effective area of the electrode and possibly conductance errors due to surface leakance. A motor-driven stirring device was operated to insure uniform temperature throughout the bath.

In determining the changes due to temperature the following procedure was employed. The capacitance and conductance of each tube were measured at room temperature. The bath containing the salt solution was cooled by means of ice to some lower temperature and the measurements were repeated. This was continued until the lowest temperature was reached, after which the bath was allowed to come to room temperature, when check measurements were made. The temperature of the bath was then raised by means of an electric heater, and similar measurements were made at several higher temperatures. Final check measurements were made after the bath had again returned to room temperature. At each point in the temperature cycle, the temperature was held constant for a sufficiently long time before the electrical measurements were made to allow the glass and mercury electrode to reach temperature equilibrium with the salt solution.

ACKNOWLEDGMENT

The writer is indebted to the Bell Telephone Laboratories, Inc., for permission to publish the results of this work performed in its laboratories, and to J. R. Weeks, Jr., and E. E. Schumacher of the laboratories' staff for assistance.

[2]Hoch, *Bell System Technical Journal*, Vol. 1, page 115 (1922).

"Telephone-Exchange" Control for Conveyor System

Motor-Control Installation on Conveyors of a Flour Mill Facilitates Handling of Sacked Product and Permits Diversity of Car-Loading Conditions

BY R. G. LOCKETT
Cutler-Hammer Manufacturing Company

A RECENT flour mill conveyor installation designed to secure extreme flexibility in operation presented several interesting problems from the standpoint of motor control.

Incoming material is taken from boats to the upper stories, where the milling and blending are done. The product to be sacked is moved to the second floor to packing machines, through the floor for sewing, and is carried by conveyors to cars.

Sixty-six motors drive the conveyor system proper, 41 being reversible. The conveyors are designed to move bags from practically any point in the building into any car in the company's loading yard. Feed belts deliver bags to four reversible trunk lines running the length of the mill and warehouse. From these the bags are deflected to eight cross-conveyors in the mill and five in the warehouse. There are also six inclined or booster belts carrying bags from the first floor to cars via the trunk lines or to be distributed into the warehouse. To deliver bags to the second or third track of cars ten portable belts approximately 16 ft. long are provided.

For the warehouse, seven "traveling hoppers" have been installed equipped with deflectors that swing out across the belt and guide bags into the hopper itself. The hoppers operate on tracks and cover all outlets to cars from the warehouse.

MOTOR COMBINATION CAN BE VARIED FOR CONTROL

From the foregoing brief outline of operations it is evident that the conveyors are worked in varied combinations, depending upon the location of material to be used, the route and destination. No definite sequence of operation could be incorporated in the control scheme without undue complication, and the control board was built around the idea of arranging the motors in groups or combinations, which could be varied.

There are in all 80 conveyors, with a total length of approximately 4,400 ft. Feed belts carry bags about 60 ft. per minute, whereas trunk lines and cross-conveyors travel at 165 to 180 ft. per minute. Sixty-three motors, 41 of which are reversible, drive the main conveyor system. These are controlled by across-the-line type starters, being 5 hp. or under. Individual fuse protection is provided. The pairs of reversing switches are mechanically interlocked. The main motor circuit being 440 volts, three phase, 25 cycles, a 110-volt transformer was provided for pilot energy, all coil circuits being energized at this voltage. Eleven busbars allow eleven different combinations of motors to be made up simultaneously, with a maximum of 27 motors on each bus. The busbars, as shown in the illustration, consist of three sections for the purpose of shipment, but are electrically continuous.

Selection of an individual motor to form part of any combination is made by the operator in the control room,

who inserts the plug carrying the desired motor number in the busbar desired. These plugs are arranged on a bench board equipped with drop cords and pulley weights, similar to those used in telephone switchboard

HORIZONTAL BELT CONVEYOR WHICH FACILITATES HANDLING OF MATERIAL

construction. The plugs are single pole, of course, and handle only one side of the individual motor control current. Insertion of plugs in busbar jacks is normally done while the busbar in question is dead, the entire set-up of a combination being completed in this way.

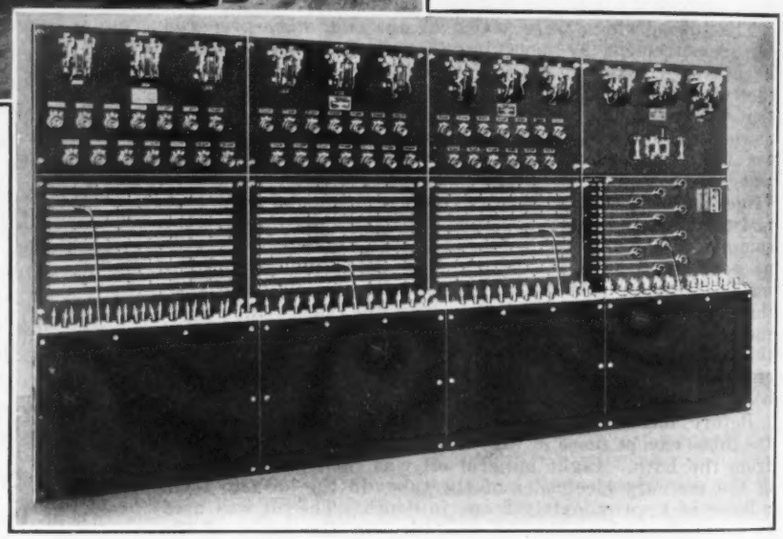
Each busbar is energized through a separate relay, which can be closed at the "end-of-stream" station, which is the start-stop station located at the car door. The eleven relays controlling these busbars can be closed only at these stations, but may be opened at either the car-loading platform or from the control board. The control room board carries a gang of special "two-wire" tumbler switches in the coil circuits of the bus relays, principally to give the operator supervision over the number of combinations of motors that can be started simultaneously in the plant.

A given combination of motors may be controlled at times from different "end-of-stream" starters, so that provision is made for selective plugging in the bus relay control stations, which are "three-wire" and provide no voltage protection. There are 22 car-loading stations, so that 22 polarized plugs in combination with eleven polarized jacks for the relay busbars provide complete selection of control stations. This arrangement is shown on the right-hand end of the board. The 22 polarized plugs are arranged on a bench board that corresponds in appearance to the other boards, and white lines on the slate aid the operator in lining up the jacks with the busbars and tumbler switches, which are labeled. The knife switch and fuses shown are in the primary of the control transformer, so that opening this switch de-energizes all control circuits. Each of the six main panels on the contactor board is equipped with a disconnect knife switch, so that all circuits may be de-energized by opening the switches shown in the illustration.

The eleven bus relay coils are energized through a master relay closed only from the station shown on the control board. Closure of this relay by the control room operator is required before any conveyors will operate. Twenty-two emergency stop stations located through the installation are wired in series to drop this relay and stop all conveyors in emergency. The four floor belts can be stopped individually from control stations.

A complete set-up of conveyor motors is thus made up in the control room, direction of rotation of the reversible conveyors being determined by selector switches which are located above the busbars.

BELOW—CENTRAL BOARD FROM WHICH ALL CONVEYORS IN FLOUR MILL ARE CONTROLLED



Possibilities of Electric Heating

APPLICATIONS of electricity to a number of industrial processes, including steel annealing, vitreous enameling, linseed-oil boiling, bitumen heating, paint drying, vacuum drying ovens, optical glass annealing, porcelain baking and bifocal lens manufacture, were cited by S. E. Monkhouse in a recent lecture in London. He mentioned recent developments which make use of high-frequency current in the production of intense local heat and said that many furnaces of this type were in operation in Britain and that these very high temperatures were being maintained with a considerable degree of accuracy. Furnaces of this type are used for melting gold, silver and platinum, which latter material requires 3,200 deg. F. The frequency adopted for work of this character is usually 25,000 cycles per second, but in one case 50,000 cycles per second is being used for heating material having a comparatively high value of resistance.

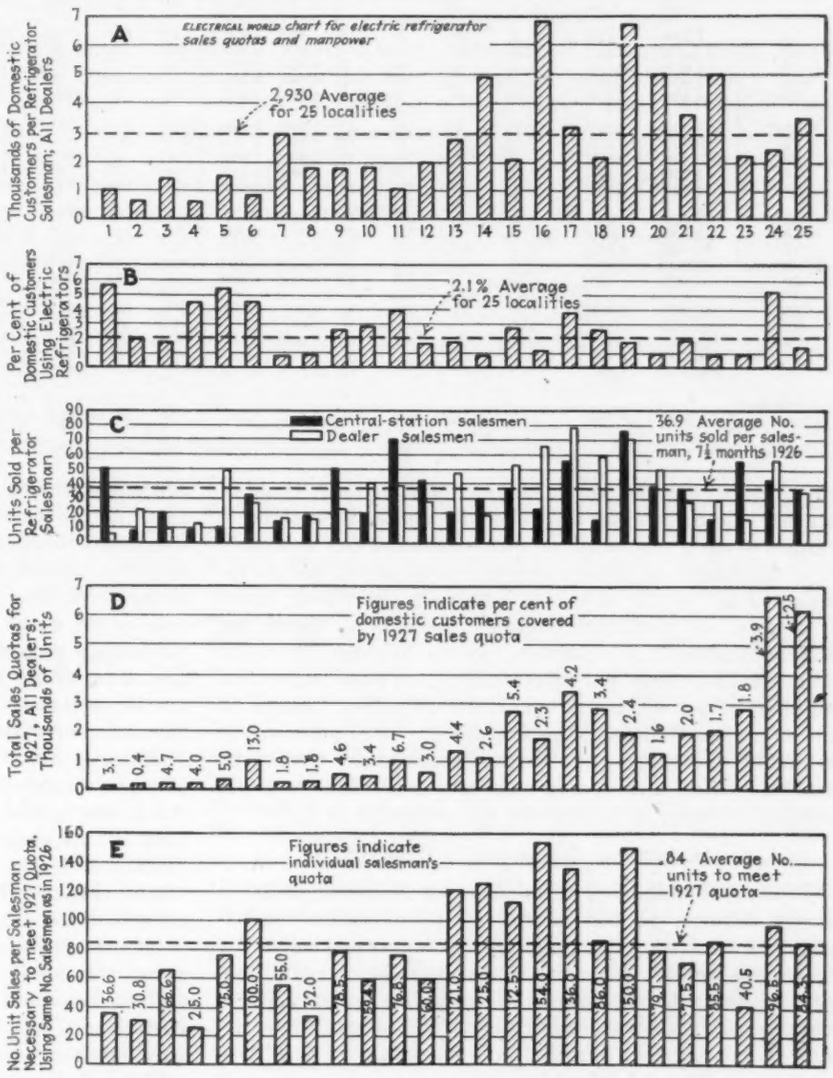
Electric Refrigerator Sales Quotas and Man-Power

Study of Past Performance in 25 Localities Indicates That Sales Forces Should Be Doubled to Meet 1927 Quotas—Ratio of Salesmen to Domestic Customers

POWER companies and other dealers have placed their electric refrigeration sales quota for 1927 at from 50 to 300 per cent more than their sales for 1926. Belief that such an increase in sales volume is attainable is based largely on confidence in the quality and reliability of the refrigerators available, increased public acceptance, the benefit of past experience in scheduling sales programs, less difficulty in obtaining deliveries and greater skill on the part of installation crews and service men.

There is no question that there is a market for the sale of several times the number of electric refrigerators that this year's quotas call for. Taken the country over, only about 2 per cent of the 15,923,060 residential customers of central-station companies are using electric refrigeration, and it is estimated that 30 per cent of these customers may be considered as legitimate prospects.

However, setting sales quotas is one thing and finding the salesmen in sufficient quantity and ability to meet these quotas is something else again. The period of greatest activity in the actual selling of electric refrigerators will commence during the next six weeks or two months, depending on the locality, and will continue thereafter for six or eight months into the fall. Desirable as a continuous year-round sales operation may be, there are undeniable seasonal features in the sale of this device of which advantage must be taken and the forehanded manager of an electric refrigeration department is planning, recruiting and organizing his sales force now. Man-power in competent salesmen will play a large part in the degree of success attained in reaching sales quotas this year, and in order to ascertain what can and must be expected of individual salesmen an analysis of electric refrigerator sales and quotas has been made.



COMPARISON OF ELECTRIC REFRIGERATOR SATURATION, MAN-POWER, UNITS SOLD PER SALESMAN AND 1927 SALES QUOTAS

Data on central-station and dealer sales, number of salesmen, 1927 sales quotas, number of domestic customers and degrees of saturation in 25 localities covered by the ELECTRICAL WORLD Electric Refrigeration Survey have been compared, as shown in the accompanying tabulation. The group was chosen to represent all sections of the country and size of localities without regard as to whether or not a good selling job was already being done.

DOMESTIC CUSTOMERS PER SALESMAN

Comparison of relative numbers of salesmen employed, units sold per salesman and sales quotas based on per cent of the domestic customers reveals some wide and startling variations in the degree and intensity of electric refrigeration sales development in different local-

Central-Station and Other Electric Refrigerator Dealer Sales, Salesmen and 1927 Quotas in 25 Localities

Locality	No. of Domestic Customers	Total No. Refrigerators on Company's Lines	Per Cent of Customers Using Refrigerators	No. of Refrigerator Salesmen			Domestic Customers Per Salesman			No. Electric Refrigerators Sold—7½ Months, 1926			No. Refrigerator Units Sold Per Salesman			Sales Quotas for 1927			Quota—Per Cent of No. Domestic Customers
				Central Stations	Other Dealers	Totals, All Dealers	Central Stations	Other Dealers	Totals, All Dealers	Central Stations	Other Dealers	Totals, All Dealers	Central Stations	Other Dealers	Totals, All Dealers	Central Stations	Other Dealers	Totals, All Dealers	
1	3,500	200	5.7	1	2	3	3,500	1,750	1,166	50	8	58	50.0	4.0	17.3	100	10	110	3.1
2	4,000	76	1.9	4	2	6	1,000	2,000	666	33	43	76	8.2	21.5	12.6	90	95	185	0.4
3	4,200	71	1.7	1	2	3	4,200	2,100	1,400	20	19	39	20.0	9.5	13.0	50	150	200	4.7
4	5,000	222	4.4	4	4	8	1,250	1,250	625	35	51	86	8.7	12.7	10.7	100	100	200	4.0
5	7,500	400	5.3	1	4	5	7,500	1,875	1,500	10	196	206	10.0	49.0	41.2	50	325	375	5.0
6	7,700	353	4.5	8	2	10	962	3,850	770	261	52	313	32.6	26.0	31.3	750	250	1,000	13.0
7	12,000	100	0.8	2	2	4	6,000	6,000	3,000	26	30	56	13.0	15.0	14.0	70	150	220	1.8
8	12,000	110	0.9	3	4	7	4,000	3,000	1,714	51	60	111	17.0	15.0	15.8	85	140	225	1.8
9	12,000	296	2.5	3	4	7	4,000	3,000	1,714	150	81	231	50.0	20.2	33.0	300	255	550	4.6
10	14,000	400	2.8	3	5	8	4,666	2,800	1,750	60	200	260	20.0	40.0	32.5	100	375	475	3.4
11	15,000	595	3.9	3	10	13	5,000	1,500	1,153	211	385	596	70.3	38.5	45.8	325	675	1,000	6.7
12	20,000	320	1.6	4	6	10	5,000	3,333	2,000	165	165	330	41.2	27.5	33.0	350	250	600	3.0
13	30,000	505	1.7	1	10	11	30,000	3,000	2,727	20	465	485	20.0	46.5	44.1	50	1,280	1,330	4.4
14	44,500	370	0.8	6	3	9	7,416	14,833	4,944	117	57	174	27.8	19.0	19.3	350	775	1,125	2.6
15	50,000	1,350	2.7	7	17	24	7,142	2,941	2,083	250	717	967	35.7	42.2	40.2	1,000	1,700	2,700	5.4
16	75,000	800	1.1	6	5	11	12,500	15,000	6,818	135	333	468	22.5	66.6	42.5	500	1,200	1,700	2.3
17	80,000	3,000	3.7	9	16	25	8,888	5,000	3,200	500	1,250	1,750	55.5	78.0	70.0	900	2,500	3,400	4.2
18	80,000	2,052	2.6	17	15	32	4,706	5,333	2,187	265	887	1,152	15.5	59.2	36.0	1,300	1,475	2,775	3.4
19	80,000	1,400	1.7	7	6	13	11,428	13,333	6,666	520	424	944	74.2	70.5	72.6	750	1,200	1,950	2.4
20	85,000	775	0.9	7	10	17	12,142	8,500	5,000	275	500	775	39.3	50.0	45.6	420	925	1,345	1.6
21	100,000	1,800	1.8	10	18	28	10,000	5,555	3,571	365	505	870	36.5	28.1	31.1	800	1,200	2,000	2.0
22	120,000	975	0.8	6	18	24	20,000	6,666	5,000	100	525	625	16.6	29.2	26.1	350	1,700	2,050	1.7
23	150,000	1,450	0.9	10	58	68	15,000	2,586	2,205	552	895	1,447	55.2	15.4	21.3	800	1,950	2,750	1.8
24	170,000	8,745	5.1	18	51	69	9,444	3,333	2,463	750	2,810	3,560	41.6	55.1	51.6	1,800	4,850	6,650	3.9
25	250,000	3,425	1.3	11	62	73	22,727	4,030	3,426	425	2,100	2,525	36.8	33.8	30.8	1,150	5,000	6,150	2.5
Totals and averages....	1,431,000	29,790	2.1	152	336	488	9,416	4,260	2,930	5,346	12,658	18,004	35.1	37.6	36.9	12,540	28,530	41,070	2.9

ities. The number of salesmen employed by central-station companies per thousand of domestic customers ranges from a minimum of 962 customers per salesman to a maximum of 30,000 domestic customers per salesman. For the 25 different localities, in which there is a total of 1,431,000 domestic customers, there are 152 central-station salesmen, or an average of 9,416 domestic customers per salesman. More than twice that number of salesmen are employed by other dealers in the same localities, and the average for the entire group is 4,260 customers per dealer salesman. Combined central-station and dealer salesmen total 488, and the average number of customers per salesman is 2,930.

Individual Salesmen's Records

That the number of customers per salesman bears a direct relation to the degree of refrigerator saturation will be seen by comparing the individual sales for these two items. Where the total number of customers per salesman is relatively low—that is, under 2,500—the degree of saturation is considerably above the average of 2.1 per cent for the entire group. In localities 1, 4, 5, 6, 11 and 24 the percentage of saturation is 5.7, 4.4, 5.3, 4.5, 3.9 and 5.1 per cent respectively. This contrasts with localities 7, 16, 20 and 22, where the saturation is 0.8, 1.1, 0.9 and 0.8 per cent. This relationship is shown graphically in diagrams A and B in the accompanying chart. It is evident, by a comparison of these figures, that the highest degree of refrigeration saturation is being obtained in those localities where the combined central-station and dealer salesmen are in a ratio of not more than one to 2,500 customers.

The number of units sold per individual salesman also varies quite widely. An average for the entire group shows that the dealer salesman has made a slightly, but not much, better showing than the central-station man—37.6 units for dealer salesmen and 35.1 units for central-station salesmen. This is probably due to the fact that there are included in these figures data from distributor-dealer organizations whose salesmen have had the benefit of considerably more experience than those with the power companies. The actual difference is not great, however, and a study of the individual salesmen's records in different localities shows that both are often doing a good job. In locality 17 the central-station company averaged 55.5 units and other dealers 78 units per salesman, whereas in locality 19 sales were 74.2 units for the central-station and 70.5 units for the dealer salesman. These two instances are very much above the average sale of 36.9 units per salesman of all dealers during the first seven and a half months of 1926. Considerably more localities show individual salesmen's records below than above the average, as will be seen in diagram C.

The question naturally arises as to why records for seven and one-half months are considered instead of the full twelve months. Final yearly figures for all localities could not be obtained and as the peak of the refrigerator season had passed in most sections by the middle of August, these figures were considered to be the most accurate attainable and have been made the basis of comparison, as a number of central-station companies and dealers have reported that from 75 to 90 per cent of the year's sales were made during the first seven and a half or eight months.

Degrees of Saturation

Examination of the central-station companies' and dealers' 1927 sales quotas shows that together they have set their bogies to sell 2.3 times as many electric refrigerators during 1927 as they did during the seven and one-half months of 1926. The combined quotas in the 25 localities total 41,070 units and contemplate the sale of electric refrigerators to 2.9 per cent of the

domestic customers. This is approximately 1.38 times the number of refrigerators in use as of Aug. 15, 1926, which would bring the number of domestic customers using electric refrigerators to almost exactly 5 per cent of the total.

To meet these sales quotas will require, primarily, greatly increased selling strength. On the basis of the existing sales forces, totaling 488 salesmen in all for the 25 localities, it will be necessary for each salesman to account for the sale of 84 refrigerator units during 1927. This means roughly that each salesman would have to more than double the number of sales closed during the seven and one-half month period of 1926. Diagram E shows the number of unit sales per salesman necessary to meet the 1927 quota, using the same number of salesmen as in 1926. Comparison of diagrams C and E shows that in no case did the salesmen in any locality in 1926 approach the sales bogy that has been set in that particular locality for the coming season.

Of course the logical answer is to put on more salesmen, and although this is more easily said than done, it appears the only solution. The maximum number of units sold per salesman was 78 in locality 17 and only six central-station and six dealer organizations sold 50 or more units per salesman.

Referring again to diagrams A and B, it will be seen that, generally speaking, in those localities where the number of domestic customers per refrigerator salesman is under the average of 2,930 the highest degrees of saturation have been attained. On the other hand, although the number of sales per salesman might be affected if his territory were reduced too much, it would hardly be possible for any man to cover adequately a district embracing more than 2,000 domestic customers, of whom 30 per cent, or 600, could be considered immediate prospects.

MORE SALESMEN WILL BE REQUIRED IF QUOTAS ARE TO BE MET

The total number of refrigerator salesmen operating in any locality will depend somewhat on the number of dealers represented, and naturally it would be possible to overdo the number of men put in the field. So far, however, the demand for capable salesmen has far exceeded the supply. Considering that refrigerator salesmen will not greatly increase their individual sales over 1926, it would be necessary in the 25 localities for the central-station companies to employ 359 salesmen and other dealers 758 salesmen—a total of 1,117—in order to reach their combined quotas of 41,070 units. Thus the power companies would have one salesman per 3,985 domestic customers and other dealers one salesman per 1,887 domestic customers and the ratio for both would be one salesman to 1,281 customers. In localities 1, 4, 5, 6 and 11, where the ratios of salesmen to customers closely approximate this figure, the relatively high saturations of 5.7, 4.4, 5.3, 4.5 and 3.9 would seem to justify the more intensive sales policies in effect.

Central-station companies and refrigerator dealers in order to reach their 1927 quotas of between two and three times last year's sales should be prepared to increase their sales man-power in almost direct proportion. In the past salesman turnover has been very high, and allowance for this condition must also be made in setting up and training an electric refrigeration sales force.

Letters from Our Readers

Real Depreciation and Theoretical Depreciation

To the Editor of the ELECTRICAL WORLD:

The accounting and engineering forces of the Public Service Commission of West Virgina have in the last two years struggled with so many millions of dollars' worth of utility property valuations that if we were to state the actual figures one might be led to say that we claimed a large part of the national utility facilities to be in West Virginia. As a large part of this work we have had to study and submit memoranda to the commission on various depreciation theories as divergent as east is from west. However, be that as it may, your editorial in the Nov. 20 issue of the ELECTRICAL WORLD entitled "Depreciation Studies Are Important" and the letter of comment by H. P. Hopson in the Jan. 15 issue bear directly upon what to my mind is the biggest problem confronting utility men in so far as rate making and accounting are concerned.

Depreciation, or loss of value, is constantly accruing to all items of property, it makes no difference whether it is a brick or concrete structure or a home-made pine cross-arm. But for some engineer or accountant to sit at a desk and say that the brick structure will lose its physical value in fifty years and the cross-arm in eight or ten is foolish.

There are houses, dams and like structures in use today whose ages are measured by eras, and I will gladly show any one interested cross-arms that never saw paint but which to my personal knowledge are more than 25 years old. We have recently completed a study a part of which was actually to inspect a steel pipe line at more than 500 points of observation. Applying to measurements taken at these points, and from the result of the observation, the methods of grading now generally adopted by competent engineers, we found the average per cent condition of this property to be better than 90, although the average age was more than 22 years. On the other hand, men will seriously state and testify under oath that steel pipe should be depreciated from 2 to 5 per cent per annum and take no recognition of the fact that part of such property may be failing at the rate of 100 per cent or more per annum, and that part—and generally the greater part—would show on actual inspection that its probable future life would be so great as to be indeterminate. This, of course, applies to many classes of utility property. Personally, I have been unable to find any reason for statements like I have indicated, except that such things may be read in books, and there are many so-called life tables that have even been granted recognition by our highest courts.

The real job is to convince people that the accumulation of a proper reserve for deferred maintenance is a problem to be determined by engineers, and not by front-office judgment. The accrual to offset obsolescence and inadequacy should properly be determined by the engineers and accountants or statisticians, and that amount held as proper for contingent reserve should be computed by the entire operating and managerial forces. To lump all this without supporting data and call it depreciation is to my mind the height of inconsistency. I will readily grant that for actual application in accounting it is necessary to develop composite figures or percentages to be applied monthly or annu-

ally, but to say that 3, 4, 5 or 6 per cent or what not is the proper amount to set aside for so-called depreciation, just because somebody thinks that looks about right, is just as bad as doing the "ostrich act" and not setting aside anything. For the use of rate-making bodies the most necessary data and convincing argument are support for the amount to be built up for contingent reserve.

A fair and competent engineer can with a sufficient degree of accuracy measure accrued depreciation or deferred maintenance; hence he may be able to forecast the amount necessary to offset these items in the future. The same sort of engineer and statistician can forecast the retirement that will be necessary because of obsolescence and inadequacy, and as a part of this calculation he can furnish an estimate of what should be set aside for replacements made necessary on account of storms, floods, fires, etc. But for the compilation of a figure to develop the contingent reserve to carry operating losses over periods of low earnings and replacements due to extraordinary losses caused by various elements, some gifted economists and logicians now have an opportunity to surge forward and make themselves prominent, as they say out in the great open spaces.

All of which, summed up, means that, in these days of high and maybe rising costs and keen competition, we should be done with guessing and develop facts which will enable us to produce figures that are real and not phantasmal.

JAMES IMBODEN,
Chief Engineer.
Public Service Commission of West Virginia,
Charleston, W. Va.

"What Is a Customer?"

To the Editor of the ELECTRICAL WORLD:

On page 339 of your issue of Feb. 12 I notice an editorial with the above heading. The ELECTRICAL WORLD editorials have been so uniformly above criticism that I hesitate to take issue with this one. In fact, it is excellent until you conclude by the recommendation that live meters plus flat-rate customers may be the proper figure to use for comparative purposes. It seems to me that you have overlooked the fact that with some companies a single residence customer may have three or even four meters on his premises, and that quite often two meters are used—one for lighting, the other for cooking or some service different from light. I might add that large stores and, especially, large industrial establishments are often served from several centers of distribution and through anywhere from two to thirty or more separate meters.

Many companies in the past two or three years, looking toward the adoption of the one-meter plan, have been using the single-meter rate with promotional follow-on rates. These companies are classifying residence service on a bona-fide customer basis, not on the number of meters. Why harp back to obsolete methods by the use of number of meters rather than real customers? Gradually, as the result of sales development and as the necessity for accurate and real informative data is better appreciated, we are coming to use a real basis of comparison, i.e., actual customers at the same location.

Most of the progressive companies are adopting this system, especially in obtaining residence data. As pointed out in your editorial, there is real need of standardization in order that the industry as a whole may obtain the benefits incident to standardized and genuine information for comparative purposes. It would seem that here is a chance for co-operation between the commercial and the accounting sections, so that the practice may be standardized for the benefit of the industry.

Best progress depends on real information as a foundation on which to build the greatest success. Many of us appreciate that much of the comparative data offered is not satisfactory. All we need is understanding of the necessity, together with such co-operative effort and standardization as will insure the desired results.

N. T. WILCOX.
Stone & Webster, Inc.
Boston.

Moral Obligation Under Guarantees Stimulates Development

To the Editor of the ELECTRICAL WORLD:

The timely editorial appearing in the ELECTRICAL WORLD for Jan. 22 entitled "Hindrances to Circuit-Breaker Development" was of much interest to me. Although most of the tests made to date on large power systems have been more or less confidential for the interested manufacturers and a few co-operating utility companies, the improvements resulting from such tests indirectly benefit all users of oil circuit breakers. It is indeed regrettable that more utility companies have not pooled their resources—men, money or breakers—in order that the burden may be more evenly equalized. This latter point cannot be overemphasized.

I must, however, take exception to the third paragraph of the editorial criticising certain utility companies for insisting that manufacturers "make good" on breakers which are proved deficient in test. If a breaker has been purchased without specific guarantees and at a later date is tested and found to be deficient in interrupting capacity, and if, in addition, it is learned that by modification the rating could be obtained and so demonstrated by test, it is obviously unfair to ask the manufacturer to stand the cost of the modifications. However, if a breaker is purchased in a competitive market under definite performance guarantees and upon acceptance test fails to meet the guaranteed rating, the manufacturer is certainly at least morally obligated to make the necessary replacement or modification to assure proper performance, and the purchaser is justified in insisting upon this.

It is my contention that breaker development has been stimulated rather than hindered by such procedure, since the manufacturers, realizing that their statements will be checked later, are not so eager to boost their breaker ratings to unreasonable values, but will endeavor to improve the equipment and provide greater safety factors in order to eliminate future complaints and replacement charges.

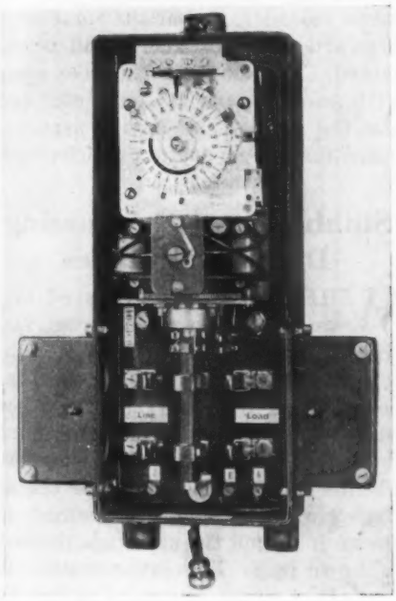
An investigation of the entire circuit-breaker situation by the ELECTRICAL WORLD would doubtless prove of great value to the industry. It is believed that very few, if any, utilities have made unjust demands upon the manufacturers for circuit-breaker replacement. If such an investigation should show this contention to be incorrect, I—and others, I am sure, holding the opinion expressed—would be glad to be corrected. An impartial statement backed by a thorough investigation of all phases of the situation should be mutually profitable to manufacturers and utilities. My purpose in writing this letter is simply to express an opinion and to encourage your paper to "carry on."

H. J. SCHOLZ,
Electrical Engineer.
Alabama Power Company,
Birmingham, Ala.

Central Station and Industrial Practice

Clock Controls Street Lights Automatically

THE new street-lighting system in St. Louis will be turned on and off automatically at sunset and sunrise by astronomical clock-operated relays which compensate



AUTOMATIC TIME SWITCH USED IN CONTROL OF ST. LOUIS' STREET LIGHTS

for the seasonal variations in night and day. The timepiece is motor wound and is said to require no more than an occasional cleaning and perhaps, once a year, a slight correction, to bring the clock exactly to standard time.

The astronomical dial has two contactors on a single drum, one for morning and one for evening. When the p.m. contact engages its first position of the day, it closes and locks an electric circuit in which is wired a "master sequence" relay. This master relay in turn sets in motion a contact drum. The first of these contacts puts current from a 13,000-volt incoming line onto the main switchboard line of the substation. At intervals of five seconds thereafter a contact closes branch circuits carrying part of the lighting load. Each branch has its own set of switches and protective devices, which are set to working automatically when the time switch acts to close its circuit.

When the dial reaches the a.m. contact, the master relay drum is in the a.m. position. This time, however, each contact of the drum operates a relay disconnecting the branch circuits successively and automatically.

Protective relays are provided for every kind of emergency that might arise on the incoming lines or on one of the distributing circuits. So long as a power source is available at the substation, the relays will keep that source connected to the station bus. When none of the incoming lines has power, the relays throw out the switches governing the branch circuits. In case of trouble on one of the branches, the relays again function, switching out the whole branch. If the trouble is in the apparatus at the station, an emergency set can be cut over by hand to replace temporarily disabled member.

The time clock, known as the Sauter clock, is made by the Electrical Apparatus Manufacturing Company, Basle, Switzerland. The substation equipment was furnished by the Westinghouse Electric & Manufacturing Company.

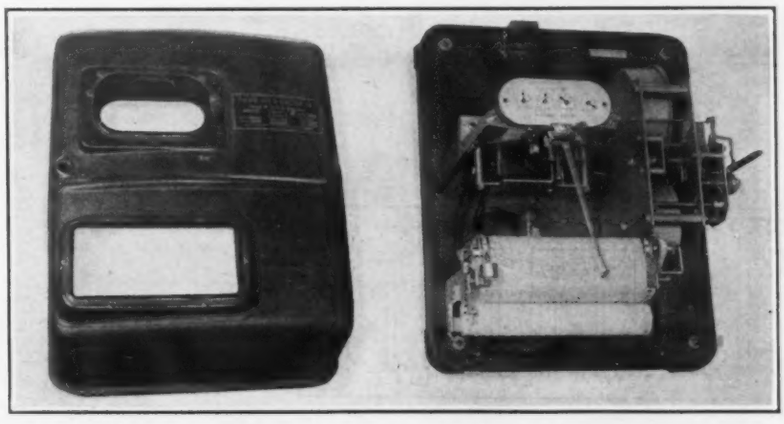
Totalizing Graphic Demand Recorder and Multiplex Contactor

BY OTTO A. KNOPP
Chief of Bureau of Tests and Inspection
Pacific Gas & Electric Company, San Francisco, Cal.

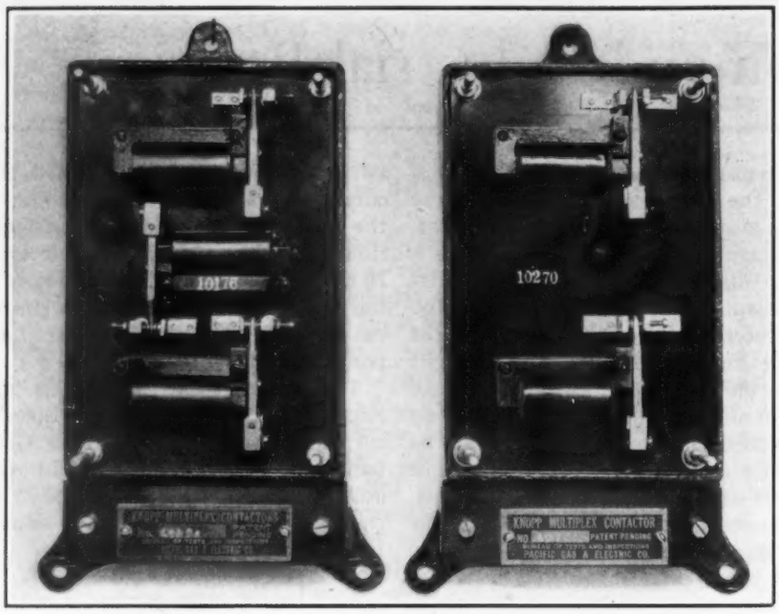
A DEMAND recorder that meets the need for an instrument to obtain at a distant point graphic strip chart records of the kilowatt demand and an integration of the kilowatt-hours registered by standard alternating-current or direct-current watt-hour meters has been developed and is extensively used by the Pacific Gas & Electric Company.

In building this recorder, which is shown in the accompanying illustration, the essential parts of a standard demand meter were used—that is, all parts with the exception of the watt-hour meter element. The latter was replaced with a solenoid and the ratchet device taken from another demand meter. An elastic shock-absorbing connection was established between the register of the demand meter and the ratchet device, and thus a recorder was evolved that has proved very satisfactory in service.

The recorder is operated from contacts installed in the watt-hour meters to be totalized. It can be used in connection with existing metering equipment by mounting a cam and contact on the watt-hour meter or meters; it may be used for either alternating or direct current; it may be used at a distant point from the regular metering equipment and can be used to register the total kilowatt-hours and record the demand of the combined load on several meters, alternating current or



DEMAND INDICATOR MADE FROM STANDARD INSTRUMENTS TOTALIZES REGISTRATION OF ANY NUMBER OF WATT-HOUR METERS



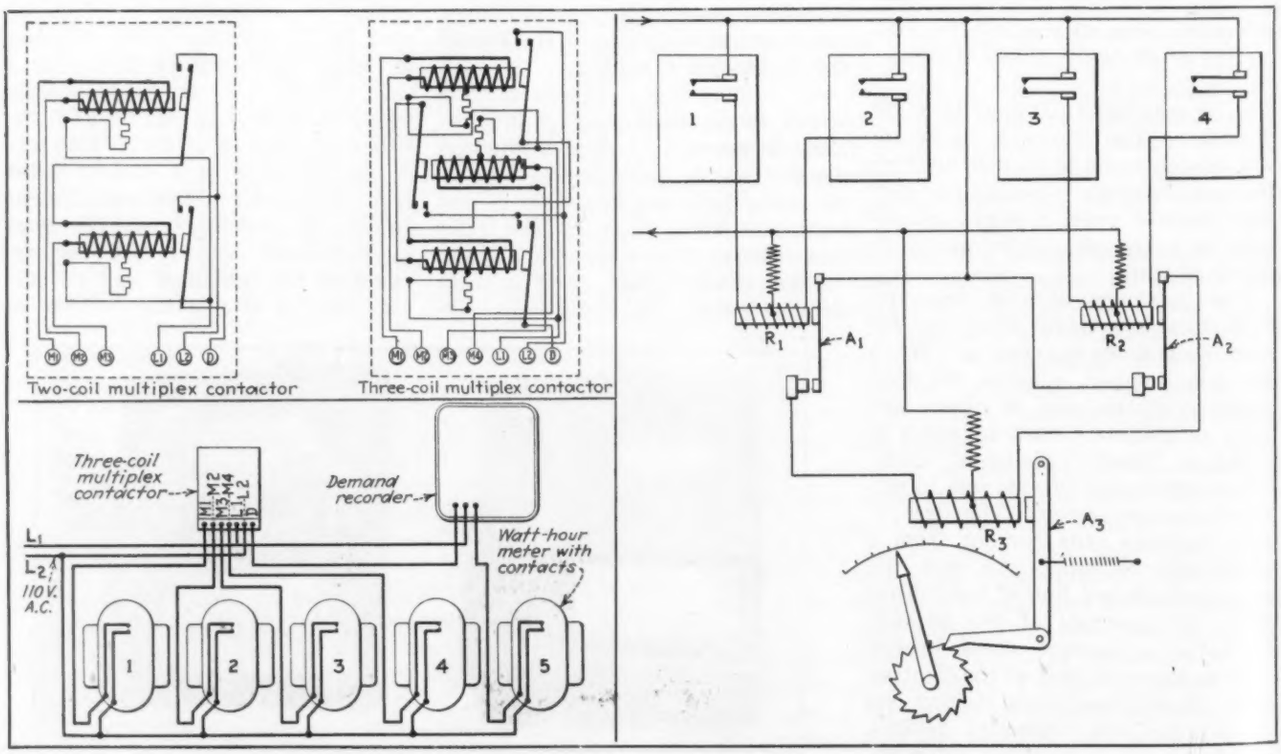
EXTERIOR VIEW OF TWO AND THREE-COIL CONTACTORS

direct current, by means of the multiplex contactor. Diagram of connections, internal and external, and illustrations of several types of contactors are shown herewith. The schematic diagram shows plainly the principle involved in the multiplex system; relay R_1 will cause the armature A_1 to make as many contacts as meters 1 and 2; relay R_2 will cause armature A_2 to make as many contacts as meters 2 and 3; relay R_3 will cause armature A_3 to advance the ratchet as many notches as the number of contacts made by armatures A_1 and A_2—in other words, as many notches as the number of contacts made by all four meters.

There are between 100 and 200 of these multiplex contactors in use by the Pacific Gas & Electric Company for obtaining the combined demand of a number of services given to one customer. In all the important installations where an accurate and reliable strip chart record is desired these demand recorders are used. The application of the multiplex contactor and recorder has resulted in considerable economy; for instance, it is possible in railway substations to dispense with the customary meter for measuring the total direct-current output. The individual motor generator meters are equipped with contacts, and through the medium of a multiplex contactor the kilowatt-hour output of any number of machines may be totalized on one demand recorder, and at the same time a record of the total demand is obtained. This arrangement does away with an expensive master meter and also the necessity of having separate buses for the generators and feeders.

Stubbing and Reinforcing Distribution Poles

WHERE poles are decayed and conditions do not warrant setting new poles, two methods of reinforcement are employed by the Alabama Power Company and the other subsidiaries of the Southeastern Power & Light Company in Alabama, Florida and Mississippi. The use of the reinforced concrete method is shown in A and the stub-pole method is shown in B. This latter method is



SCHEMATIC WIRING DIAGRAMS OF TWO AND THREE-COIL TOTALIZING DEMAND METERS

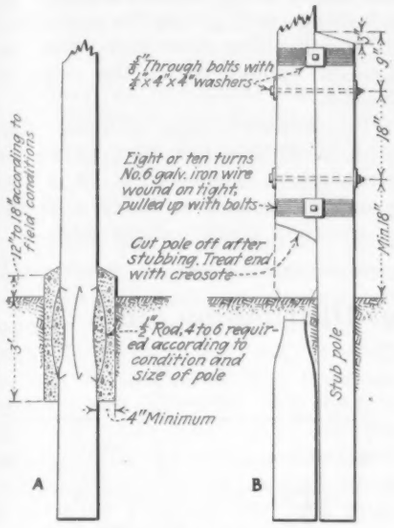
At left, top—Internal connections of two and three-coil contactors.

At left, bottom—Wiring diagram for totalizing and recording the combined demand of five loads by means of the demand recorder and three-coil multiplex contactor shown in the illustration above.

At right—Schematic diagram of multiplex system for combining four loads.

seldom used, as it is more expensive than the other.

In the concrete method ½-in. rods are first driven into the pole, four to six being used according to conditions and size of pole. Where a stub pole is used, this is bolted to the old


8" Through bolts with ¼ x 4" x 4" washers
Eight or ten turns No. 6 galv. iron wire wound on tight, pulled up with bolts
Cut pole off after stubbing. Treat end with creosote
12" to 18" according to field conditions
1" Rod, 4 to 6 required according to condition and size of pole
4" Minimum
Stub pole
18"
Min. 18"
3'
A
B

CONCRETE AND WOOD STUB METHOD OF REINFORCING POLES

pole and both are bound together with eight or ten turns of No. 6 galvanized wire as shown, the wire being drawn tight by bolts. The old pole is then cut off and the end treated with creosote. The use of patented reinforcing washers is also recommended.

Electrolytic Cell Protects Against High Voltages

BY C. E. STRYKER
Fansteel Products Company, North Chicago, Ill.

ONE OF the problems in metering and regulating direct-current voltages of 1,200 to 1,500 volts and higher such as are used in railway work is to protect the men who have to work on apparatus that requires routine adjustment. Full-line voltages must be impressed on these devices and their accompanying external resistances, and in case of open circuit the full pressure to ground menaces the operator.

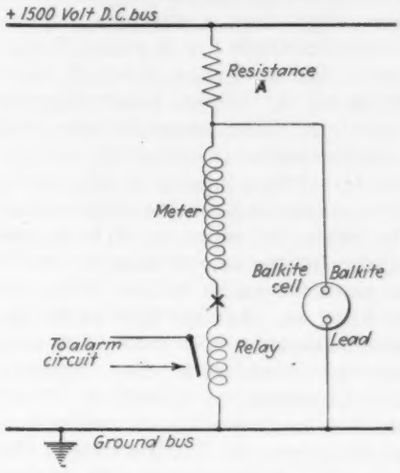
The property of the tantalum-lead cell to prevent current flow in one direction unless a certain upper limit of voltage is reached is made use of by the Commonwealth Edison Company in the substations serving 1,500-volt direct current to the Illinois Central Railroad. The cell has been found perfectly satisfactory in meter installations because the current leakage through the film on the tantalum electrode is so small as to be negligible and it is therefore permissible to connect the cell in shunt around a meter.

In use a Balkite cell is connected in the circuit as shown in the diagram. The normal pressure on the cell is about 50 volts, and since the cell is connected with the tantalum electrode on the positive side of the circuit, no current flows. If, however, the meter circuit should be opened at *X* there will no longer be any current through the resistance *A*.

There will then be no voltage drop across *A* and the voltage across the cell will tend to increase to 1,500. As soon as it exceeds 60 volts current will flow through the cell and this current will increase as the voltage rises until sufficient drop is produced in resistance *A* to balance the circuit. An equilibrium will be reached in the neighborhood of 110 volts.

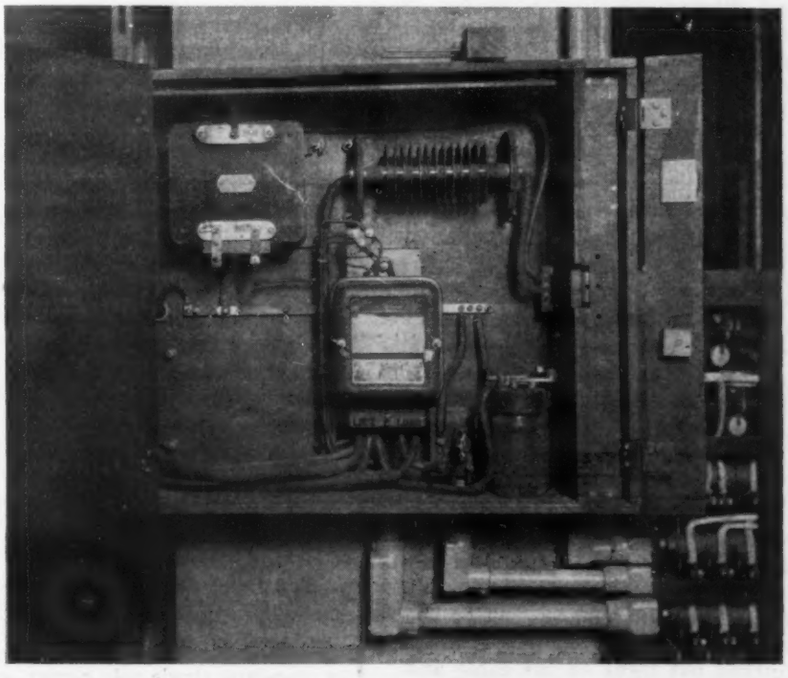
The function of the relay is to close an alarm circuit and notify the operator that the apparatus has failed. As soon as the voltage across the cell is reduced to normal the film will restore itself, making the cell entirely automatic in its functioning. The flow of current through the cell is accompanied by some eating away of the positive electrode, but since current flows only in emergency and then only for short times, this deterioration does not seriously affect the life of the cell.

The installation shown in the illustration is used to protect men working at the meters from high voltage in the event that they accidentally open the potential circuits in the meters. Standard low-voltage watt-hour and recording voltmeters con-



CONNECTION OF PROTECTIVE CELL TO SERVE AS SAFETY VALVE

nected in series with a high resistance were used on this job. The normal voltage across the watt-hour meter coils was 110, so that two Balkite cells were connected in series to handle this voltage. The provision of this high-voltage arrester made it possible to use standard meters and yet have an installation which may be relied upon as entirely safe.

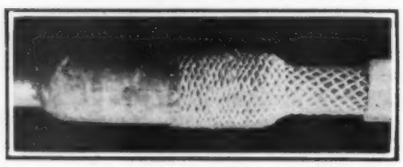


PROTECTIVE CELL SAFEGUARDS METER TES TERS

Fireproofing of Lead Cable

BY A. D. PETTEE
Assistant Engineer Distribution and Installation Department, New York Edison Company

THE application of fireproofing materials to lead-covered cables where they are exposed in manholes has always been a laborious process. Several methods are in vogue for applying the materials, most of them involving a tedious hand-wrapping operation. The common rope and cement mortar combination involves the spiral wrapping of a ¼-in. hemp or jute rope at a ¼-in. spacing around the cable, to serve as a base and binder for the cement mortar, which is plastered on to a total thickness of ⅝ to ¾ in. Another type of binder used with cement mortar is a wire lath provided with clay buttons. This is wound on spirally in strips about 3 in. wide. It is not only a laborious process, but the ends of the lath wires form a source of danger to the hands of the workmen. Another common fireproofing material is asbestos tape in various forms,



ASBESTOS STOCKING AND CEMENT COVERING FOR FIREPROOFING CABLES AND SPLICES

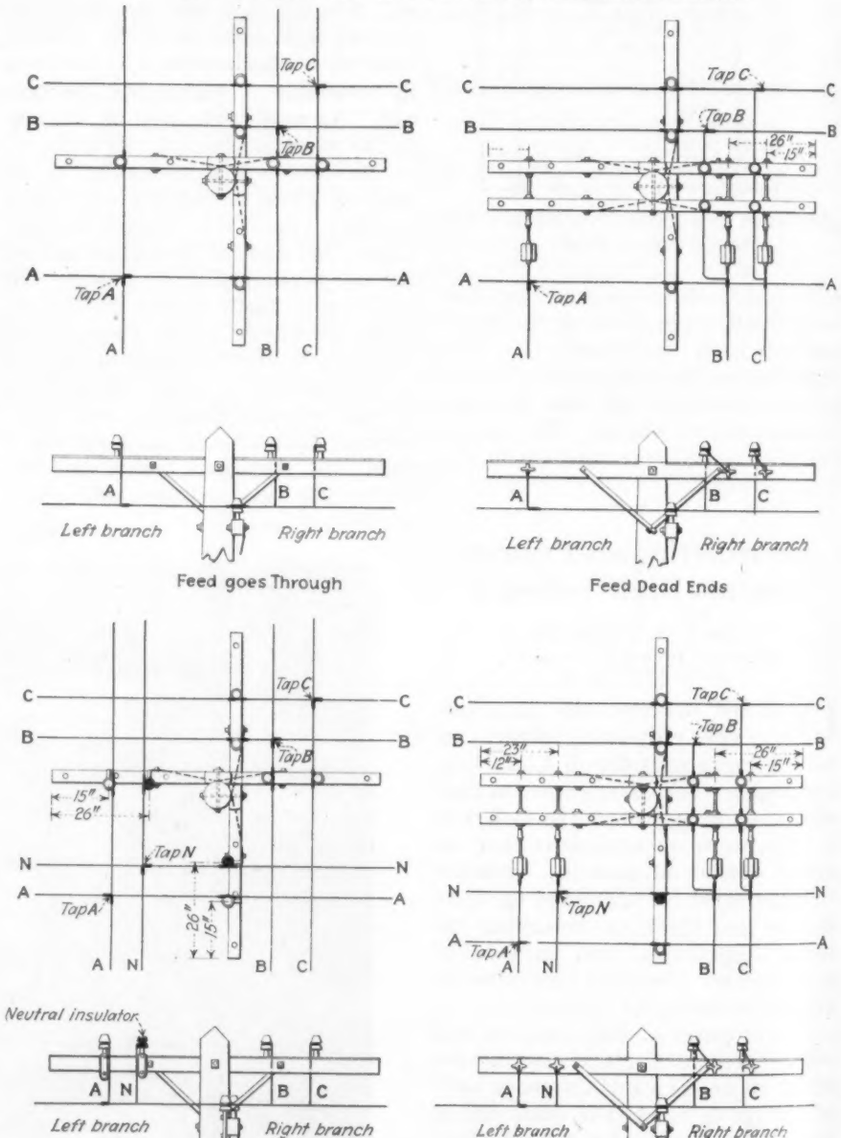
used either with or without a cement mortar. A fourth method is the use of a cement mortar applied directly to the cable, with a binding tape wound spirally around the outside. All of these methods, it will be noted, involve a tedious hand-wrapping operation.

The elimination of this hand-wrapping operation is the purpose of a new combination of materials now being tested by the New York Edison Company. In this combination the means of avoiding the wrapping operation is a woven open-work stocking of asbestos cord, which is slipped over the end of the cable before it is spliced and serves as a base or binder for the cement mortar. The stocking (see illustration) is woven with a diagonal mesh so that it can be compressed endwise, slipped over the end of the cable and pushed back out of the way while the joint is being made. After the jointing operation the stocking is stretched out tight on the cable and the ends are tied down. As the illustration shows, the diagonal mesh construction permits the stocking to be expanded over the joint. This is a marked advantage, since the spiral wrapping of any tape, rope or wire lath over the enlargement at the end of the joint is always an awkward procedure. After the stocking is stretched out tight on the cable, the application of the cement mortar follows as usual, this being now the only laborious part of the fireproofing work. The crossed asbestos cords form an admirable binder and reinforcement for the cement mortar, permitting the cement to surround the cords completely at many places, thus securing a firm grip on them. A reasonably well reinforced concrete structure is thereby assured.

For those cables that are already spliced an open-work diagonal mesh band has been devised, which is folded about the cable longitudinally, the edges being drawn together by a lashing cord, giving the equivalent of the stocking described above, although applied after the cable is spliced.

Preliminary tests indicate that with a suitable cement mixture the combination is very effective in fireproofing, as well as being a means of avoiding much tedious labor.

Corner Construction for Distribution Lines



THE four upper illustrations show a standard single-pole corner at a two-way branch point in a three-wire, three-phase circuit of the West Penn Power Company. The remaining diagrams show a single-pole corner at a two-way branch in a four-wire, three-phase circuit.

Commercial Activities and Public Relations

Cultivating Public Good Will Through Advertising

Principles to Observe in Building Satisfactory Public Relations Through the Medium of Advertising—Personal Contact of Employees with the Public Most Essential

BY H. P. MEGARGIE
American Gas & Electric Company

EVERY public utility is faced with the problem of advertising—of how and when and where to advertise. The slogan of advertising men, "It pays to advertise," is itself so well disseminated that it is assumed to be axiomatic. We are told by economists that the amazing prosperity and high living standards in this country are in a large degree due to it. We note that the most successful industrial concerns are those that do the most advertising, so that the general impression is that success in business is dependent on the amount of printers' ink spread before the public eye.

Within certain limits, the well-organized commercial organization receives big dividends from advertising, but the public utility's problem, although similar, has certain inherent differences.

Under ordinary commercial usage advertising is defined as "salesmanship through the printed word," but in the electric light and power industry, or in fact in any public service business, conditions vary so widely from those in a mercantile establishment where the only objective is to sell a product that this definition does not fairly describe our conception of the word for the reason that it accents too strongly the idea of sales.

Certainly the utility must sell its product and do so at a profit if it is to exist, but the fact that there is so great a public interest affected by its operations makes that which is usually a secondary purpose assume primary importance.

Therefore in our business we might adopt this definition for want of a better one—"Public utility advertising is an organized effort to cultivate good will and mold public opinion and also to sell a service."

The expression "printed word" does not appear in this formula because, although we believe that the written message has a definite place in utility advertising, of still greater importance is the advertising to be obtained by personal contact of employees with the public. Distinctly, there are two classes of advertising for utilities:

1. The printed message wherein the company has something to say and says it truthfully and forcefully.
2. Contact advertising, which must be supported by the highest possible type of service.

The foremost opinion in the industry is to the effect that money spent for newspaper and kindred publicity is thrown away unless the management has succeeded in building up an organization of courteous, intelligent employees who are ever vigilant to give their best in serving the public and each one of whom is a walking advertisement of the company's policy.

We have no difficulty in recalling instances of public utilities spending large sums for advertising campaigns (particularly when they were in trouble), which failed because of the lack of amicable relations between the employees of the company and the public. Fortunately this condition is fast becoming a thing of the past.

Generally speaking, it does pay the utility to advertise, but we must follow that statement with a number of contingent "ifs" and "ands" as to supply, demand and the advertising itself before determining the degree of dividends to be secured.

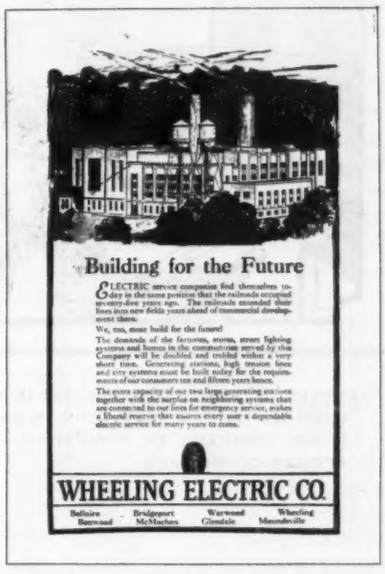
The printed ad must tell the truth in public utility advertising as in any other field. It must be built on and with facts, and a simple, frank exposition of the message is desirable with the truth hammered home.

Finally, the printed advertising will be successful if the organization is prepared to give service to the community. When every employee, from the manager down to the smallest office boy, keeps constantly in mind that he or she is a public servant, then and then only will advertising pay a fair return on the investment.

An executive who is not courteous toward and accessible to his employees and the public cannot expect those under his direction to assume an attitude different from his own. The more he extends his contacts both with other employees and with the public the happier will be the results all along the line.

Possibly not all the employees have equal opportunities for making contact, but each one has his own

Ohio—No. 21
Here's a List of All Your Gifts
for
for
SEE your electrical dealer if you are in doubt as to the particular kind or type of electrical gifts to buy. Consider his suggestions seriously—remember that in buying Christmas presents, as in anything else, two heads are better than one.
Do Your Electrical Christmas Shopping Early
The OHIO POWER Co.


Building for the Future
ELECTRIC service companies find themselves today in the same position that the railroads occupied seventy-five years ago. The railroads extended their lines into new fields years ahead of commercial development there.
We, too, must build for the future!
The demands of the factories, stores, street lighting systems and homes in the communities served by this Company will be doubled and trebled within a very short time. Generating stations, high tension lines and city systems must be built today for the requirements of our consumers ten and fifteen years hence.
The extra capacity of our two large generating stations together with the surplus on neighboring systems that are connected to our lines for emergency service, makes a liberal reserve that assures every user a dependable electric service for many years to come.
WHEELING ELECTRIC CO.
Bellaire Bridgeport Warwood Wheeling
Benwood McMechen Glendale Moundsville

EXAMPLES OF CONSTRUCTIVE, EFFECTIVE PUBLIC UTILITY ADVERTISING

circle of friends and acquaintances who look upon him as something of an authority, so that it is necessary for him to inform himself about his company, its service and departmental functions, in order that he may answer questions and meet arguments with full knowledge of his subject.

In this business of public service, indifference, carelessness or discourtesy reflects directly on the company and the management, and the reaction to some apparently trivial action is to make an enemy of the offended customer and to waste, as far as he is concerned, the money spent for advertising. An employee who is not courteous has no place in this kind of an organization and the successful one goes beyond politeness and exercises tact and diplomacy.

It does pay to advertise, but only when our printed words are backed up by a full measure of organization, co-operation and service.

Radio Socket-Power Devices Yield High Revenue

JUST how much energy is consumed by socket-power devices for operating radio sets has been more or less a matter of conjecture. Consequently to secure some authentic data on this subject a radio user who is primarily interested in electric-service utilities installed a watt-hour meter on his socket-power supply for a period of 30 days. It was found that an average of exactly 1 kw.-hr. per day was used to operate a radio set with five large tubes for an average of six hours per day.

The socket-power equipment consisted of the latest type Willard A unit and a Freed-Eisemann B eliminator with a relay switch so that the A battery was on trickle charge all the time the set was not in operation. The average demand of the A unit was 60 watts and of the B eliminator 32 watts. A trickle charge of 0.65 amp. was found to be required to keep the storage A battery from becoming discharged under the operating conditions during the test.

At the rate of 1 kw.-hr. per day the monthly consumption for the two socket-power devices was 30 kw.-hr., which yielded the power company a revenue of $1.80 per month at a rate of six cents per kilowatt-hour. The maximum demand being 60 watts, the load factor was 70 per cent.

The radio set and socket-power equipment involved can be considered fairly typical of conditions in cases where alternating-current supply is used, the furnisher of these data believes, but he adds that the most skeptical may even reduce the 30 kw.-hr. per month by one-third and still find the consumption and revenue surprisingly high.

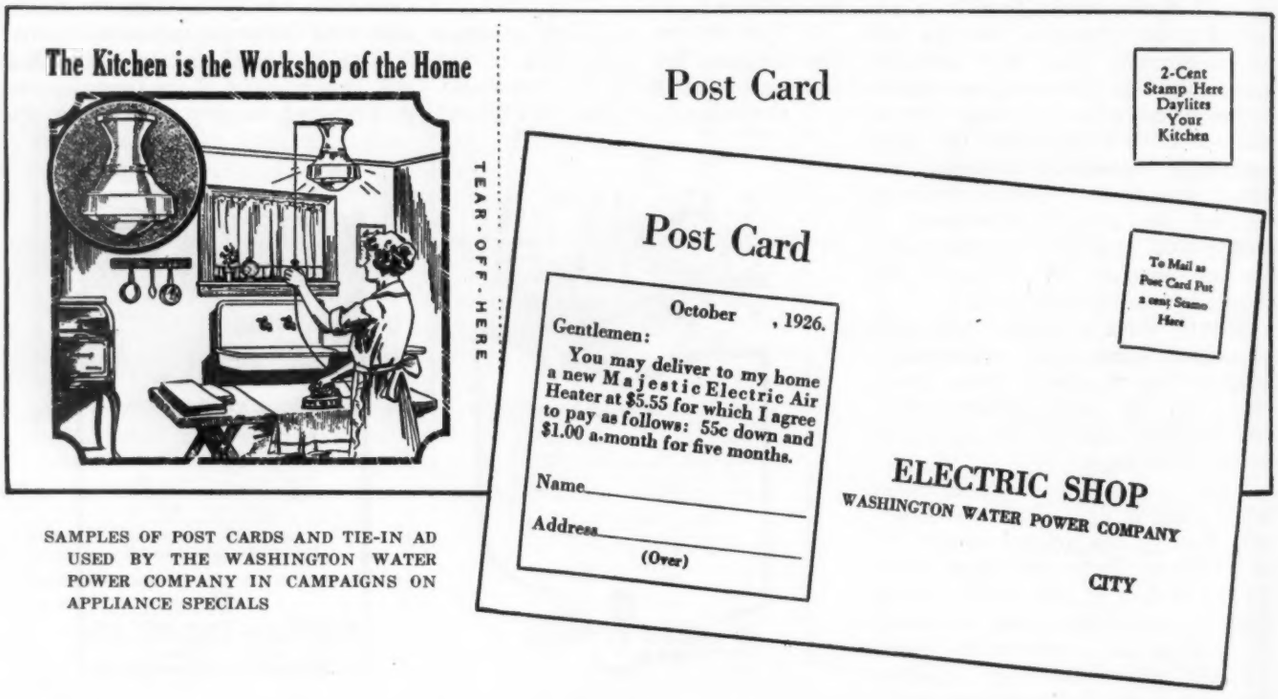
It is interesting to note that the energy consumption in the two-room apartment where the test was made was 109 kw.-hr. during the same month, for lights, radio set and three table appliances.

Post Cards Aid Special Appliance Sales

IN PUTTING on sales of appliance specials several times during the year the Washington Water Power Company, Spokane, Wash., has found that a very satisfactory volume of sales has resulted from the distribution of special return post cards with customers' bills. On one side of the card is an order blank for the use of those desiring to purchase the special appliance being featured. Advertising copy is carried on a detachable section of the card.

In these specials, of which there are usually about eight a year, it is the company's practice to sell only standard appliances on which a merchandising profit can be made. When opportunities present themselves advantage is taken of good buys which manufacturers can offer on discontinued lines or on models that have been superseded because of slight changes.

On the first of the month during which the sale is to continue the campaigns are announced with a small newspaper advertisement, and during the month a tie-in advertisement is used similar to that illustrated. In the case of a waffle iron or similar special a woman demonstrator is used at the company's appliance salesroom. Other than this no special sales effort is put back of the appliance. In this manner a headlight heater campaign during October, 1926, resulted in the sale of


The Kitchen is the Workshop of the Home
TEAR-OFF-HERE
Post Card
2-Cent Stamp Here Daylites Your Kitchen
Post Card
To Mail as Post Card Put a 2-cent Stamp Here
October , 1926.
Gentlemen:
You may deliver to my home a new Majestic Electric Air Heater at $5.55 for which I agree to pay as follows: 55c down and $1.00 a month for five months.
Name
Address
(Over)
ELECTRIC SHOP
WASHINGTON WATER POWER COMPANY
CITY

SAMPLES OF POST CARDS AND TIE-IN AD USED BY THE WASHINGTON WATER POWER COMPANY IN CAMPAIGNS ON APPLIANCE SPECIALS

650 heaters and a percolator campaign during December of last year sold 429 percolators. The normal sales of these appliances would have been about 100 and 200 respectively, so it is seen that the campaigns produced more than ordinarily satisfactory results at a comparatively small expenditure.

A feature of the percolator campaign during December was the offering of a pound of coffee donated by a local concern, and during a waffle-iron campaign now in progress a jug of sirup donated by a local manufacturer is given with each iron as a premium. These inducements, together with low down payment and low monthly payments, have been partly responsible for the success of the campaigns.

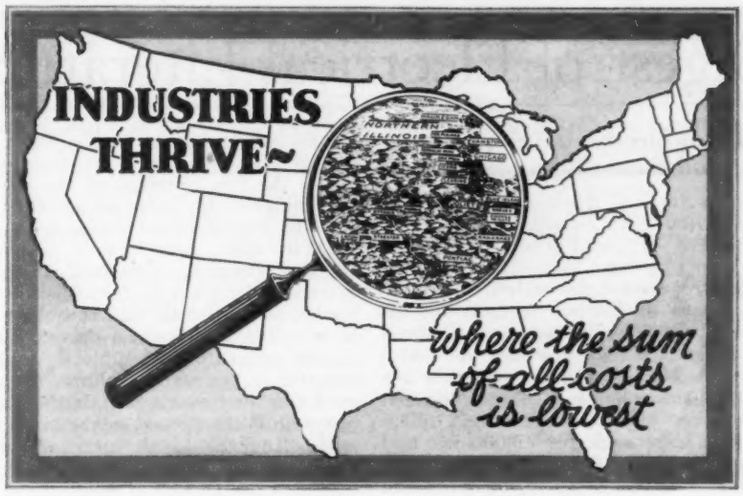
Among the post cards illustrated is one used in a kitchen-lighting campaign which proved just as effective as broadsides and at only a fraction of the cost. The card was a complete order in itself and was a scheme used to get added interest during a campaign in which salesmen were actively canvassing all the available territory.

Utility Issues Booklet on Industrial Promotion

THE industrial development department of the Public Service Company of Northern Illinois has brought out an interesting booklet that received its first distribution at the second Midwest Power Conference in Chicago. The book, including the cover, which is here reproduced, contains fourteen pages of white glazed stock and is 12x8½ in. in size.

The publication is addressed to industrialists who might be expected to locate plants in the Chicago district. Emphasis is placed on the proximity and easy transportation access of this territory to the vast mineral and agricultural resources of the Middle West and to the market of nearly half the entire population of the United States which lies within 48 hours or less by rail. Reference is made to "The Greatest Pool of Power in the World" in these terms:

"The electrical-generating capacity economically available to Chicago and surrounding territory is approximately 1,250,000 kw.—slightly less than 1,750,000 hp. Approximately 6,000 square miles of this surrounding territory, practically 30 times the area of Chicago, is supplied with both electricity and gas by the Public Service Company of Northern Illinois, whose system forms a part of this large pool of power. It is an unquestionable fact that no one area in the world of the same size and general characteristics has more electrical energy available. From an industrial point of view this is vitally important."



COVER OF NEW INDUSTRIAL PROMOTION BOOKLET

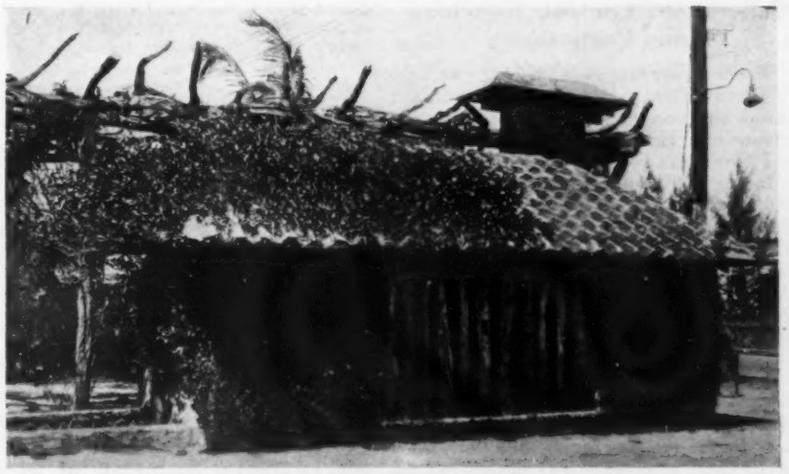
A very refreshing and effective quality of the book is the fact that the electrical utility that published it has exercised a fine restraint in the matter of its own name and the service it renders. The problems of factory location are treated strictly from the viewpoint of the manufacturer. All of the factors contributing to industrial progress and expansion are given their due and proper weights, thus making the actual presentation of the interesting information concerning this territory both consistent and entirely convincing to the reader.

Skillfully Concealed Transformers Preserve Good Will

BY FREDERICK KRUG
Assistant to President Porto Rico Railway, Light & Power Company

LARGE distribution transformers mounted on poles are objectionable and unsightly, and customers much prefer to have them located where they are not so noticeable. The accompanying illustration shows a semi-outdoor type of transformer vault built to conform with the Spanish architecture of the Condado Vanderbilt Hotel in Porto Rico that is being supplied with light and power and to blend unobtrusively with the surroundings.

Being situated in a garden, the vault has become overgrown with creeping plants, and unless closely examined would never be suspected of housing electrical equipment. Secondaries from the transformers are carried in ducts under the street.



TRANSFORMER BUILDING CONFORMS TO ARCHITECTURAL STYLE OF NEIGHBORHOOD

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Hydro-Station Eguzon (France).—A. CURCHOD.—An output of 75,000 hp. was added to the Paris-Orléans electrification by the completion of the Eguzon hydro-electric station, about 100 miles south of Paris. A dam 200 ft. high and 1,000 ft. wide, erected across the River Creuse, provides a useful hydraulic head of 155 ft., which is utilized in a power house, located at the foot of the dam. Five vertical shaft spiral type turbines, each for 15,000 hp. and 250 r.p.m., drive five three-phase generators of 12,500 kva., 10,500 volts and 50 cycles. A unique double penstock arrangement feeds three of the sets from an intake at the left end of the dam and two sets from an intake at the right end. A small auxiliary penstock branched from each of the main pipes supplies each 650-kva. station-demand generator. An outdoor type switching and transformer station delivers the output of the plant to two transmission lines, one operating at 90 kv., the other at 150 kv. The local area near the power house is supplied directly from the generator buses.—*Revue Générale de l'Electricité*, Jan. 22 and 29, 1927.

Steam-Condenser Practice and Performance.—J. F. CHATEL.—This paper presents a general idea of steam-condenser practice and performance in the four plants of the Detroit Edison Company. The condenser performance from the time of the original installation down to the present shows a marked improvement. This indicates that condensers of a single-path type, with a range of from 0.95 to 1.05 sq.ft. of surface per kilowatt of turbine capacity, should be considered good practice. Their performance, according to the author, seems to outweigh the fact that a somewhat larger amount of water is necessary for this type than for a two-path condenser or for a condenser having more tube surface. — *Mechanical Engineering*, March, 1927.

Generation, Control, Switching and Protection

Diesel Generator.—H. GLOCKNER and B. KAUFMANN. — Hamburg, Germany, claims the record size of Diesel motor-driven electric generator. Its municipal plant has recently installed a nine-cylinder, double-acting Diesel engine of 15,000-hp. output at 94 r.p.m., which is direct connected to a 10,500-kw. three-phase generator. The cylinders of the motor have 33-in. bore and 60-in. stroke. The weight of the Diesel motor is 1,070 tons, its floor space is 76 ft. x 14 ft., its height 39 ft. As it was required that this set should operate in parallel with a steam turbo-generator, a high degree of speed uniformity was necessary, for which reason the rotor of the generator had to be made much heavier than mechanical and electrical design would have required. The rotor actually weighs 120 tons, or one-half the total weight of the generator. Rotor and stator are each made of four parts. While the two bearings of the machine are designed for ring oiling, it is possible to introduce oil under high pressure in these bearings to lessen the starting friction. One-half of the required cooling air is furnished by fan blades on the rotor and the other half is supplied by a motor-driven blower. As the generator is completely inclosed, essentially the same volume of air is used over and over again, with a water-cooler unit interposed in the circulating path. In case of an internal fire the available amount of oxygen is thus quickly exhausted. A motor drive with a 1: 7,000 reduction is available to turn the rotor and Diesel motor for inspection. The set is started with compressed air. A sixteen-pole exciter dynamo, with so-called isthmus-poles, supplies d.c. to the 64 rotor poles. Delivering 13,000 kva. unity power factor, the generator has an efficiency of 96.9 per cent and the Diesel motor consumes 306.3 grams of oil per kilowatt-hour. —*Siemens Zeitschrift*, January, 1927.

The Theory of Repeated Networks.—A. C. BARTLETT.—The theory of transmission through a number of repeated networks is worked out from first principles and obtained in a simple form that at once reduces to that for artificial lines if the networks are symmetrical. Three-element artificial lines are described, a number of which have the same characteristic impedence as a uniform line.—*Journal of the Institution of Electrical Engineers (England)*, February, 1927.

Units, Measurements and Instruments

Notes on Kilovolt-Ampere Meters.—F. L. E. METZ.—It is possible to modify the design of a standard energy meter to register kilovolt-amperes with a reasonble degree of accuracy over the range required and a few notes on this subject make up the article under this head. Attention is called by the author to a variety of errors which must be taken into consideration in the development of this type.—*World Power (England)*, February, 1927.

Transmission, Substations and Distribution

Sag Calculations for Power Transmission Lines.—W. T. TAYLOR. — For such work, which nowadays involves much more steel construction and much longer spans than was the practice in the past, it is necessary to so choose the sags as to maintain a safe and economic balance between conditions such as: (1) The strength of line supports required to resist the conductor tension at terminal points and tangents in the line, with moderate or small sags. (2) The dimensions of line supports required for minimum ground clearance, and for proper separation of the conductors from each other, for large sags. In the calculations for sag, many variables are present. Calculations are made on the assumption that the supports are at the same level; likewise that the supports are absolutely rigid and that the conductors are fixed solidly to their supports. The author discusses in detail a number of the variables which must be met in the design and construction of a transmission line.—*Electrical Review (England)*, Feb. 25, 1927.

Illumination

Lighting and Contrasts.—P. W. COBB and FRANK K. MOSS.—This paper discusses the results obtained in the laboratory relative to contrasts. First, the "revealing" contrast between the visual object and its immediate background; second, the contrast and adaptation effect of working back and forth between fields of different brightness, and, third, the effect of contrast as between the working area and outlying areas within the field of vision are considered. —*Transactions of the Illuminating Engineering Society*, February, 1927.

Motors and Control

Electric Drive for Ring Spinning Frames.—F. B. HOLT.—The ring spinning rooms of a spinning mill absorb approximately one-half of the total power of the mill. They are also the departments where steadiness of drive is most important and any variation from a basic speed set for a particular count being spun will result in faulty yarn and loss of production. In most of the Lancashire mills with steam-engine drives the speeds of the line shafts in the ring spinning room range from 200 to 300 r.p.m. This is mainly due to the fact that the speed of the steam prime mover is only 25 to 70 r.p.m. The author proceeds to discuss alternative methods of electric drive substituted for steam. Advantages of the squirrel cage motor are enumerated.—*Electrician (England)*, Feb. 25, 1927.

Automatic Secondary Resistance for Induction Motors in Steel Mill Applications.—C. KIESSLING.—A general discussion of the advantages of automatic resistance regulators and a description of a number of specific designs manufactured by Swedish firms are provided in this paper.—*Teknisk Tidskrift, Elektroteknik*, Jan. 8, 1927.

Use of Belt on Motor Drive.—GORDON FOX. — A previous article, entitled "Using Flexible Couplings on Motor Drives," which appeared in the December, 1926, issue of *Industrial Engineer*, was the first of a series on the method of mechanically connecting a motor to a driven machine or other load. This article discussed the use of flexible couplings and clutches, with particular attention to the direct-connected drive in which the driven shaft is in a straight line with the motor shaft. This second article continues the discussion of mechanical methods of connecting up the motor drive where the shafts are parallel. These mechanical connections for motor drive may be made by non-metallic links, such as rope and leather, fabric-made or composition belt, or metallic link, such as chains or gears. This article deals with a non-metallic motor-drive link. Of these

links, leather belts are the most widely used, although fabric-made and composition belts as well as a number of belts of special construction are used on many industrial loads. Ropes are not widely used on motor drives. Belt drives are flexible, inexpensive and elastic and afford protection to the motor and machine in the case of overloads and shocks. To a certain extent the belt serves as a safety link for the driven machine corresponding to the fuse for the motor. In case of excessive overload or sudden stoppage the belt slips off the pulley usually before the machine breaks. Where the load is heavy as on hammer drives, belts of special construction have frequently been required and their application is discussed here. — *Industrial Engineer*, March, 1927.

Alternating-Current Wave Windings. —R. G. JAKEMAN.—Simple algebraical formulas are developed by means of which, with close approximation, the angular positions of the phases of wave windings can be determined. In this way the amount of asymmetry can be determined in fractional-slot windings, d.c. wave windings and windings with extra empty slots. Tables are provided showing the numbers of extra empty slots that can be used and the positions in which they must be placed in order to obtain practically symmetrical windings. Methods are developed for determining the connection points of windings and charts are given suitable for use in practice, for phase windings, both with a whole number and a fractional number of slots per hole and phase.—*Journal of the Institution of Electrical Engineers (England)*, February, 1927.

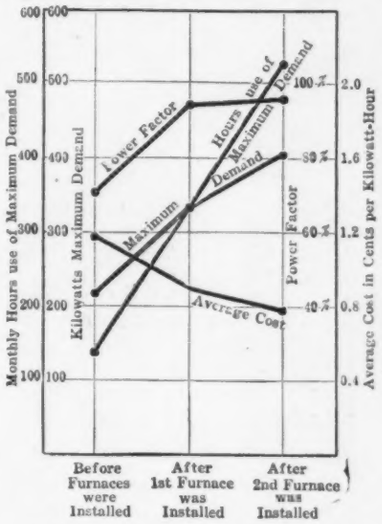
Electrification of Steel Mills in Sweden.—FILIP FREDEN.—Sweden has a total of about 200 steel mills, of which only about 50 per cent are electrified at the present time. The author gives a general review of the progress of this electrification, the systems most commonly in use and the probable trend of future developments. General data are given for 68 of the electrified mills; 36 of these have drives with special speed regulation; of these 36 mills sixteen utilize induction motors with cascade regulation, twelve direct-current (Ward Leonard) and eight induction motors with slip regulation (Krämer system). — *Teknisk Tidskrift, Elektroteknik*, Jan. 8, 1927.

Traction

Over the Lötschberg on a 4,500-Hp. Locomotive. — THEODORE RICH. — The author undertakes to correct the general impression that all the important railways in Switzerland are owned by the federal government and enumerates the private companies still owning and operating a considerable mileage of line. He names as one of the most active of these the Bernese Alps Railway, which owns the Lötschberg Railway as well as one route from Berne to Thun, a line from Berne to Neuchatel and an important link between Legnau and Moutier on the Délémont-Berne line. Until recently the traffic over the Lötschberg tunnel route was mainly handled by locomotives crank-connected to two twin-gear driven dummy shafts, with two single-phase motors of a combined capacity of 2,500 hp., rated on a 1½-hour basis. These locomotives were designed to haul 300 tons each. Increase of traffic on the line necessitated the use of a locomotive of a more powerful character and this new unit the author proceeds to describe in detail. — *Electrical Review (England)*, Feb. 25, 1927.

Heat Applications and Material Handling

Electric Furnaces Improve Power Factor.—M. P. WHELEN.—The author lists the following advantages among those possible to obtain by use of the electric furnace: (1) Uniform heat throughout the furnace; (2) heating cycle easily recorded and duplicated; (3) automatic temperature control—eliminating the human element; (4) greater production due to quicker heating; (5) no dirt and soot to fall—



GRAPHIC ILLUSTRATION OF CHANGE OF CONDITIONS

meaning less rejections. These advantages, together with improvement in power factor and cheaper operating cost of the electric furnace, have encouraged the rapid adoption of this type of heating for a variety of manufacturing processes, some of which the author outlines in detail. — *Electrical News (Canada)*, March, 1927.

Telegraphy, Telephony, Radio and Signals

Electric Dust Precipitators and Radio Reception.—F. MULLER.—Shortly after the military restrictions in the occupied zones of western Germany were relieved and general radio reception was permitted, grave interferences were noticed from the many electric dust precipitators installed in the surrounding mining districts. The heart of the trouble was found in all cases to be the synchronously driven rectifying spark gap, which changes the high voltage a.c. into approximately 50 kv. d.c. The secondary of the feeding transformer, together with the spark gaps and the capacity of the precipitators, formed an excellent oscillating circuit, which emitted waves of 200 to 300 m. length. The disturbance was plainly noticeable within a radius of 20 km. and more. Three methods to remedy the interference are suggested in this article: (1) Increasing the capacity by placing high-voltage condensers parallel to the precipitators. (2) Insertion of ohmic resistance into the high-voltage connections at properly selected points. (3) Replacement of synchronous rectifiers with vacuum tube rectifiers.—*Siemens Zeitschrift*, January, 1927.

Electromagnetic Theory and the Foundations of Electric Circuit Theory. —JOHN R. CARSON.—The present paper examines the foundations of electric circuit theory from the standpoint of the fundamental equations of electromagnetic theory and a derivation of the former from the latter is made, in the course of which the assumptions, approximations and restrictions tacitly involved in the equations of circuit theory are explicitly stated. The treatment is sufficiently extended to show how the familiar equation for the simple oscillating circuit and the so-called telegraph equation can be deduced from the Maxwell-Lorentz statement of electromagnetic theory.—*Bell System Technical Journal*, January, 1927.

Miscellaneous

Ozone Generators and Their Use.—W. WILKE.—The highly oxydizing character of ozone (O_3) and the simplicity with which it can be produced electrically by subjecting air to corona discharges led twenty years ago to the first commercial installations of ozonators for the sterilization of drinking water. Former ozonators were frail, difficult to adjust and inefficient. In their latest design a heavy glass tube forms the dielectric, and both electrodes are water cooled, permitting the safe application of very high electrical stress and therefore much larger output than older types. Difficulties were experienced in insulating the electrodes from each other and the ground when water cooling was introduced. At first the stream of water was interrupted by two douches (multi-water jets). Later an oil bath was introduced, through which the water passed in drops. An 8-in. column of oil will thus insulate sufficiently a passage of water at a potential of 11,000 volts. It was further found that an increase in frequency brings about an almost proportional increase in the generated amount of ozone, so that modern ozonators operate usually with 500 and up to 10,000 cycles. For example, the same ozonator will produce 14 grams of ozone per hour when operated with 50 cycles and 70 grams with 500 cycles. Very dry air is essential for a high output of ozone. Best results are obtained by freezing the water component of the air. A combination of refrigerator and ozonator with an air temperature of zero deg. F. is now in general use. The leading phase displacement of the current is partly compensated by series choke coils or resonance transformers. For any bacteriocidal purposes a content of 1 milligram of ozone per cubic meter was found to be ample. For accelerated oxydization 40 to 100 times that amount will be required.—*Siemens Zeitschrift*, January, 1927.

New Books

Switching Equipment for Power Control

By Stephen Q. Hayes. New York: McGraw-Hill Book Company, Inc. 556 pages, illustrated.

The second edition of this book was prompted by the advisability of giving recognition to the many progressive changes in the design of switching equipment which have taken place in the past six or seven years. The author has included in his revision a number of European ideas on control equipment that appear likely of adoption in this country. Certain of the long chapters of the first edition have been subdivided into two or more in the second edition, and some of the material has been regrouped. It is pleasing to note that a generous amount of space has been devoted to a treatment of the extensive development of steel-clad switchgear and the use of compound-filled switching apparatus.

Alternating-Current Rectification and Allied Problems

By L. B. W. Jolley. Second edition, revised and enlarged. New York: John Wiley & Sons, Inc. 471 pages, illustrated.

New chapters on installation of thermionic rectifiers, radio supplies and the inverter have been added to this edition. The entire book has been revised, and it now covers the whole subject of rectification in a thorough manner. It is a fundamental type of book where each process or rectification is treated quantitatively and in detail. Any one interested in this subject will find the book of much value, and it should be a welcome addition to college textbooks. With the greater use of the mercury rectifier in this country the mathematical and practical treatment of Mr. Jolley will prove especially helpful. Moreover, the heretofore mysterious inverter is explained thoroughly, so that its practical possibilities can be measured.

Hydro-Electric Handbook

By W. P. Creager and J. D. Justin. New York: John Wiley & Sons, Inc. 897 pages, illustrated.

Eleven experts in several lines of work connected with hydro-electric development have contributed to this new and complete handbook. They have done fine work, and the material has been edited and co-ordinated in excellent fashion by Messrs. Creager and Justin.

The book deals with rainfall, evaporation, run-off, stream flow, capacity, storage, hydraulics, general design, dams, conduits, controls, flumes, canals, tunnels, water hammer, surge tanks, power-house structures, hydraulic turbines, electrical design, electrical equipment, transmission, reports, river gaging and operations. It is a complete compendium of the practices and principles of hydro-electric developments. As a handbook it is filled with data, and in addition the contributors discuss trends and practices in thoroughly expert manner. The publication is an engineering handbook primarily and would have been strengthened by the inclusion of more cost data and more discussion of the economic aspects of hydro developments as parts of power systems. Those who contributed were W. P. Creager, J. D. Justin, G. C. George, J. H. Gandolfo, N. C. Grover, E. E. Halmos, R. A. Hopkins, J. C. Hoyt, W. W. Tefft, B. E. White and W. M. White. This notable group of experts has made a very valuable contribution to engineering literature.

Electric Power Stations

By L. W. W. Morrow, managing editor ELECTRICAL WORLD. New York: McGraw-Hill Book Company, Inc. 326 pages. Price, $4.

This work is a sound discussion of the fundamental principles of production, transmission and distribution of electrical energy on a large scale in an economical manner. The book covers such topics as plant sites and their layout, coal, oil and gas and their use in electric power stations, steam, auxiliary energy supply, boiler room, turbines, electrical equipment and switching. Throughout the book emphasis is placed on principles underlying the selection of proper equipment for specific conditions and on the methods of utilizing this equipment to best advantage.

Main Street and Wall Street

By William Z. Ripley. Boston: Little, Brown & Company. 359 pages.

Professor Ripley's remark in his introduction to "Main Street and Wall Street" that he prefers the weapon of honey to that of a sting gives the imagination some scope in estimating the probable character of his thesis had he chosen the second type of weapon. His powerful indictment of certain alleged abuses in connection with the financing of corporate enterprise scarcely implements any expectation of gentle handling founded on his expressed preference in methods of attack. Professor Ripley is eminently equipped to diagnose industrial procedure and policy. Himself a director of the Chicago, Rock Island & Pacific Railroad since 1917, he has obeserved the inner workings of large-scale enterprise. As adviser on transportation to the United States Industrial Commission, administrator of labor standards for the War Department, chairman of the National Adjustment Commission of the United States Shipping Board and special examiner for the Interstate Commerce Commission, Ripley the theorist has gained a practical working knowledge of the structure and technique of business. Although deserving of some criticism in regard to details, "Main Street and Wall Street" goes to the heart of many of the colossal problems arising out of the inevitable divorcement of ownership and control in industry.

One of the most extensive arguments set forth, and yet probably the least convincing, is contained in an attack upon the institution of no-par stock. With regard to this Professor Ripley concludes: "Inasmuch as the issuance of no-par shares cuts the ground from under any attempt to correlate closely the amount of the investment and a stated par value for the securities, it is clear that regulation and no-par shares are utterly incompatible one with another."

Under the caption "Getting Out from Under," Professor Ripley attacks the exemption of directors from liability for the success or failure of their enterprise.

Some of the more constructive suggestions offered in the book include permanent shareholders' committees to act in a liaison capacity between management and ownership, full publicity of corporate finances based on reform from within, increased supervision and control by the Federal Trade Commission, and the enfranchisement of bondholders. The holding company is not condemned to die. Its value is recognized and certain restrictions are urged.

Rotary and Motor Converters

By Ernest F. Smith. London: Crosby Lockwood & Son. 233 pages, illustrated.

This book undertakes a comparatively non-technical explanation of the rotary converter, its design, operation and performance characteristics. The machine is considered first as constant-current apparatus, then as an alternator and finally as a rotary unit. The appeal of the text has been enhanced by the non-mathematical type of treatment which has been observed throughout.

The concluding chapter deals with the motor converter, and in this instance alone it has been found more convenient by the author to illustrate certain fundamental relationships by the use of comparatively simple mathematics.

Book Notes

Notes on the Induction Motor. By H. E. Dance. New York: Oxford University Press, American Branch. 152 pages, illustrated.

The object of this book is very obviously to illustrate principles rather than to catalog practices in the design and operation of induction motors. Simple graphical methods are employed throughout the text to picture the development of the necessary fundamental data. The greater part of the material contained in the book is original only as regards its arrangement and the brevity of its treatment, a fact the author fully acknowledges.

Elementary Heat and Heat Engines. By F. G. R. Wilkins. New York: Oxford University Press, American Branch. 312 pages, illustrated.

This is a good book on the elementary principles and practices of up-to-date thermal engineering. The treatment throughout the text is simple, direct and without doubt admirably suited to a course intended primarily to provide an insight into the principles underlying the operation of heat engines.

The Blue Book: The Electrical Trades Directory and Handbook. London: Ernest Benn Brothers, Ltd. 1431 pages.

The 1927 edition of the Blue Book has just been published. It gives details of the British electrical industry in detail and a condensed treatment of the industry in the British colonies and on the Continent of Europe. Handbook material, British standards and a classified and alphabetical list of men, trades and industries make up the contents of this valuable reference book.

News of the Industry

No Action on St. Lawrence in Sight

Governor Smith's New Bill Unacceptable to Republican Legislative Majority, Whose Own Bill Is Thought Sure to Meet Executive Veto

ONCE more, despite optimistic press reports to the contrary, compromise between Governor Smith of New York, who is unwilling to abandon his proposed Water Power Authority, and the Republican majority in the Legislature, which desires to set up an investigating commission to determine the proper method of developing state hydro-electric sites, has failed to be effected. Two bills are now before the legislators at Albany—a new bill, indorsed by the Governor and representing the limit to which he is able to go in the way of concession, and the bill sponsored by the Republican leaders.

The Governor's bill sets up a New York State Water Power Authority of three, with wide powers of investigation and negotiation, to report to the Legislature on or before Jan. 15, 1928, a comprehensive plan of development. The measure provides that, "in the event that the commissioners are unable to present a plan under the conditions outlined, this fact shall be stated in the report of the authority, and reasons for such conclusion and the source of the underlying difficulties shall be fully set forth. The report shall also set forth whether in the opinion of the commissioners the difficulties and obstacles in the way of development of such a comprehensive plan are removable by state, federal or other action, or whether they arise from economic conditions which cannot be changed."

An alternative bill submitted by the Governor provides that there shall be submitted to the people at the general election in 1927 the question: "Should a new law be passed providing for development of the water-power resources of the state on the Niagara, St. Lawrence and other streams by a State Power Authority similar to the Port of New York Authority, instead of proceeding under existing law to grant to private corporations licenses to develop such resources?"

Accompanying the introduction of the bills was a message from the Governor of 1,500 words in which he declared: "After careful consideration, I have become firmly convinced that an investigating commission would be a sheer waste of time and would simply be a joke at the expense of the people of the state."

The Republican bill creates a temporary commission of five members to "study and investigate the entire water-power situation in the state, with particular reference to ascertaining and forming a conclusion, for consideration by the Legislature, regarding the policy which the state should adopt as to the manner in which the water-power resources of the state should be utilized and hydro-electric energy developed therefrom, whether by the state, by a state agency or power authority, by private capital, or in any other manner that will best conserve the public interest."

By the Governor's bill he would nominate the commissioners, subject to ratification by the Senate. The opposing measure provides that two members be appointed by the Governor, one by the temporary president of the Senate and one by the Speaker of the Assembly, none of them to be a member of the Legislature. The four thus appointed would choose a fifth member.

Everything indicates that the Legislature will ignore the Governor's bill and pass the majority measure, which Governor Smith will promptly veto, leaving the *status quo* of deadlock undisturbed.

MILLER LAW ATTACKED

In the meantime the constitutionality of a part of the Miller water-power act of 1921, now in force but inoperative, is being questioned in the Appellate Division of the State Supreme Court. This section of the power act, which is being attacked for the first time since its adoption, authorizes the Public Service Commission to grant certificates of convenience and necessity by which power companies owning a majority of the stock for any power development may take the minority holdings by condemnation. The case under review concerns the only development in which the Miller act was ever successfully invoked — one on the Salmon River in Oswego County made at Altmar by the Niagara, Lockport & Ontario Power Company.

Hoover Sees the St. Lawrence Yielding 5,000,000 Hp.

Talking at New Haven under the auspices of the local Chamber of Commerce last week, Secretary of Commerce Hoover again indorsed the projected St. Lawrence River waterway. Regarding the power-generating features of the plan he said in part:

"The development of power is a fortunate and valuable by-product. While the total cost of the works on the St. Lawrence will amount to about $600,000,000, our engineers estimate that, after we deduct that portion of the works which will be taken over by the power development, we are left on various estimates with a cost to the governments of from $100,000,000 to $200,000,000, which itself may some day be recovered from power. This is not a stupendous sum for two nations like the United States and Canada.

"During the last fifteen years the perfection of long-distance transmission of electricity to the commercial markets has made possible a large recovery of the cost of these works through the sale of the 5,000,000 hp. which will fall over these dams. It would take some years to absorb this volume. But time moves swiftly in our industrial demands. In so short a time as fourteen years we have increased our use of electrical power on the whole North American continent from less than 17,000,000 hp. until today we are using about 48,000,000 hp."

Mr. Hoover proposed an international governmental body to push the whole project through.

Secretary Work to Appoint Fact-Finding Committee

On his return to Washington May 1 Secretary Work of the Interior Department expects to appoint a fact-finding committee to bring together pertinent and practical information having a bearing on the development of the Colorado River. The committee, Secretary Work says, is to be "composed of competent, disinterested men able to advise the government and the department on the merits of the proposal as a whole." The emphasis which Secretary Work places upon an investigation of the problems of the entire river is regarded as significant. Although he expresses disappointment over the defeat of the Swing-Johnson bill, the Secretary is not proposing a restricted study of Boulder Dam, but says:

"Protection against floods and drought is imperative now in the lower basin. Water rights fixed by prior use of the water seem to be about the only settled question in water litigation. Unless the government secures to the upper basin states the rights to subsequently store water they are not now ready to impound, the right to do so will soon be lost to them forever. Water stored high up on any river finds its way back into the stream farther down, or can be used over and over again, but if appropriated below it can never be returned.

"This Colorado River project has made more progress toward realization in the past two years than in the previous twenty-five and is only delayed because private interests were antagonistic and its importance not generally understood. The last Congress was the first to give the strategic importance of the Colorado River any part of the study and discussion its possibilities for harm or economic uses warrant. We are going forward with our attempts to advise the public fully of the exact situation there as we understand it and have no fear of the final outcome, but regret this delay."

Public Ownership Men Plan Educational Campaign

Plans to prevent the Boulder Dam and Muscle Shoals projects from being "exploited by the electrical power trust" were discussed at a recent meeting of Senators and others. Those attending were Senators Norris of Nebraska, Johnson of California, Frazier of North Dakota, Borah of Idaho, Nye of North Dakota, Howell of Nebraska, Norbeck of South Dakota and Harris of Georgia; Gifford Pinchot, former Governor of Pennsylvania; Basil Manly of the People's Legislative Council, and Judson King of the National Popular Government League. The meeting was held in Senator Norris' office.

An intensive campaign this summer to educate the public in the importance of the projects and to "combat the activities of the power trust" was determined on.

Activities of Federal Power Commission

Another case of municipal ownership versus private development has arisen on the Kalamazoo River at Allegan, Mich. The city of Allegan is seeking rights which conflict with an application filed by the Fargo Engineering Company. Under the plans submitted to the Federal Power Commission it would appear that the Fargo company proposes a fuller use of the water than the municipality, but the costs of the respective developments are not known as yet.

After an investigation by its engineers the Forest Service recommends the acceptance of the application of the Oroville-Wyandotte Irrigation District for power rights on the South Fork of the Feather River in California. The development of power is incidental to the supply of water for irrigation purposes, but 42,000 hp. of primary power will be made available. It is proposed to install 62,000 hp. The proposed development is to consist of a series of six conduits and power houses which will utilize a gross head of 4,700 ft. The project interferes to a limited extent with an earlier plan which proposed a diversion from the projected Little Grass reservoir and the development of power on the Middle Fork of the Feather River.

The Federal Power Commission has extended by one year the limitation date of the preliminary permit granted April 2, 1926, to the Roanoke Power Company. The permit covers a 50,000-hp. plant on Buggs Island, near Clarksville, on the Roanoke River in Virginia.

No application for a license, under Section 23 of the water-power act, for a constructed project will be entertained by the Federal Power Commission unless the applicant holds rights of such character that it may continue its project without obtaining a federal license. This ruling of the commission's chief counsel was approved by the commission itself at a meeting on March 15. Where Section 23 does not apply, it is possible for the commission to proceed under Section 4 of the act, the law officer rules, which means that the fair value of the project as of the date of the license is not applicable as it is in cases under Section 23. Section 4 provides that the net investment must be determined under the provisions of the statute on the basis of actual, legitimate, original cost.

Clinch River Withdrawn from Present Development

With its three members in attendance, the Federal Power Commission on March 15 voted "that for the present no action will be taken on any applications on any project on the Clinch River on account of the bearing such action might have on the utilization and disposition of Muscle Shoals." While no mention was made in the resolution of the upper Tennessee and its tributaries other than the Clinch, the action of the commission is regarded as padlocking the whole Tennessee River to await the disposition of the government's properties at Muscle Shoals.

This decision was arrived at during the visit in Washington of the joint water-power committee of the Tennessee Legislature, and members of that committee declared it to be an unfair exercise of federal power because it lays an embargo on Tennessee when other states are developing their power resources and even finding lucrative markets for their power in Tennessee.

While in Washington the committee conferred with O. C. Merrill, executive secretary of the Federal Power Commission, and its members are understood to have expressed themselves as satisfied with his demonstration that the federal government is not infringing on the rights of the states and that the water-power act carefully sustains those rights. The committee also called before it M. O. Leighton of the East Tennessee Development Company, who explained why it is necessary for that company to undertake the development of eleven separate power sites.

Comprehensive Rate Case Now Before Kansas Commission

Sixty-three cities and towns of Kansas served with electric light and power by the Kansas Gas & Electric Company have found themselves concerned in the outcome of a rate case initiated by the city administration of Wichita in an effort to lower the charge made there for electricity. Uniform rates obtain in all the communities served, ranging from the second largest city in the state to towns of 1,000 population or less. The rate now in effect is the lowest average rate charged by any electric light and power company in the state. Despite this fact, the city of Wichita contends that it is entitled to a rate decrease owing to its comparative density of population.

Should Wichita's rate be lowered by the commission, other cities in the company's territory will insist that they also be made beneficiaries of the reduction. Until the present case was filed virtually no dissatisfaction over rates or service had been formally expressed since the company began operation.

White River Dispute Over?

Common Stock Issued by Dixie Hydro-Electric Company Absorbed by Arkansas Power & Light

SALE of the water-power rights and the physical properties of the Dixie Hydro-Electric Power Company, a company organized in 1912 to develop the water power of the White, Buffalo and Crooked Creek Rivers, to the Arkansas Power & Light Company has been virtually completed, according to a statement given to the Little Rock press by the last-named company's attorneys. Thus, it is asserted, will end the long period of litigation between the Arkansas Power & Light Company and the North American Company, rival applicants before the Federal Power Commission for rights on the streams named. Each company claimed to have made an agreement with the Dixie company which established it as the rightful successor to the latter.

By the exchange of its common stock for that of the Dixie concern and the assumption of the latter's obligations the Arkansas Power & Light Company, it is held, has now attained an indisputable status, and an adjustment of the matters in litigation with the North American Company is expected to follow. The Federal Power Commission had postponed decision in the dispute awaiting the outcome of the efforts at clarification.

Pacific Coast Commercial Men Are in Earnest

Sounding the keynote of "more information concerning the electrical business to our own employees" in practically every paper read, the Commercial Section of the Pacific Coast Electrical Association held its spring meeting in Los Angeles on March 9 and 10. The sessions were characterized by the sincere interest on the part of every one, and the committee reports showed clearly that there had been a serious attempt to bring to this section meeting some real constructive thought. There were more than 150 registered.

Chairman H. K. Griffin gave a short introductory talk. Others who took part were Daniel F. McGarry, president of the Los Angeles Chamber of Commerce; W. L. Frost, Southern California Edison Company (through R. E. Smith); W. P. Graef, chairman of the customer relations committee; A. M. Frost, chairman of the agricultural power committee; E. J. Cipperly, chairman of the industrial heating committee; J. W. Wrenn, chairman of the commercial cooking committee; K. I. Dazey, chairman electric truck committee; P. P. Pine, chairman domestic range committee; H. C. Goldrick, chairman general merchandising committee, and Clark Baker, Sr., chairman lighting committee.

In the discussion of the commercial heating report Ray Turnbull, Pacific Coast sales manager of the Edison Electric Appliance Company, took issue with the expressed opinion that the first cost of apparatus is too high to make it possible to popularize it with restaurant owners. He said that what is

chiefly needed is working contact between the sellers of the energy and the restaurant-supply houses. Results of an exhaustive questionnaire were summarized in the domestic-range report. It was held that in repair work after the expiration of the manufacturer's guarantee period the customer would have to pay for material, labor and transportation.

The refrigeration committee had prepared a set of questions and answers which it is the intent to have printed in pamphlet form for distribution to all employees of the member companies. The questions are the ordinary ones which the average individual would be likely to ask an employee of a power company, and the answers are given in simple non-technical language.

On the evening of March 9 a banquet, presided over by Harry Harper, manager of the Los Angeles branch of the Graybar Electric Company, was held in the Chamber of Commerce Building. William Baurhyte, president of the Los Angeles Gas & Electric Corporation, made a short address.

Fight Over Ottawa River Goes On in Canada

Further attempts to bring about the passage of a bill renewing the charter of the Montreal, Ottawa & Georgian Bay Canal Company have so far failed in the Canadian House of Commons, the opposition expressing the opinion that the renewal of the charter would only result in setting up a hydro-electric monopoly along the route of the proposed canal. Premier Ferguson of Ontario has taken a hand in the fight, asserting that the question is purely and simply whether a valuable asset belonging to the people should be turned over to private interests. "The Province of Ontario requires all its power reserves," he says, "and eastern and northern Ontario are urgently in need of an increased supply of power at the present time. The Hydro-Electric Power Commission of Ontario is prepared to undertake development on the Ottawa River immediately to meet these demands, but no such development can be initiated with this canal charter carrying with it the power rights. It is said that the canal company expects to pay the cost of construction through the sale of power. In other words, the power users must pay for the canal and pass the increased cost on to the general public."

A new and potent factor in the situation is the publication of a letter from C. A. Magrath, chairman of the Ontario Hydro-Electric Power Commission, in which he declares that both Ontario and Quebec will strongly oppose the passage of a bill renewing the canal company's charter. Mr. Magrath maintains that the idea of handing over to private interests an interprovincial water highway over 200 miles in length is repugnant. The Hydro commission, he says, would not think for an instant of buying power from the canal company at several dollars per horsepower more than it can be had for from private sources within the Province of Quebec, and the commission will not begin power development on the Ottawa until the question of ownership of power sites is settled once and for all.

The Ontario Legislature has also placed itself on record as being strongly opposed to the measure now before the Dominion Parliament, and the leader of the Conservative party in Quebec has introduced a motion in the Legislature of that province which asserts its right to ownership of hydro-electric power originating in its waterways and also expresses opposition to the export of hydro-electric power from the Dominion.

Flowers Talks in Oklahoma

Vivian, Chase and Ealand Also Address Meeting of the State Public Utilities Association

EXPECTATIONS as to the size and success of the annual convention of the Oklahoma Utilities Association at Oklahoma City, of which a preliminary report was printed last week, were fully realized. The registration reached 825 as against 800 last year, every branch of the electrical industry being represented. There was a good exhibition of apparatus. On Wednesday, which was the big day of the convention, eight different meetings were in session at the same time, including a luncheon and conference of the Oklahoma women's committee, Public Relations Section, N.E.L.A., in connection with other women employees and guests attending the convention, and a Speakers' Bureau luncheon and conference which was addressed by W. S. Vivian, Chicago, chairman of the public speaking committee, N.E.L.A.

Mr. Vivian also addressed Thursday's general session, when he said that "public relations" as applied to the public utility business means "human relations." "It is the application of the Golden Rule," he continued. "It guarantees a square deal to customer, stockholder and employee. It assures a full measure of service for each dollar received. There is nothing spectacular or mysterious about it."

H. B. Flowers, president New Orleans Public Service, Inc., who is president of the Southwestern Geographic Division of the National Electric Light Association, told of the part played by the utilities in the development of the South. "We have a tremendous responsibility," he asserted. "Our industry must not only keep pace with the increase in population but it must far exceed it proportionally. Our population has increased 40 per cent in twenty years. The electrical industry has increased 2,000 per cent."

Samuel A. Chase of the Westinghouse Electric & Manufacturing Company discussed "Selling the Electrical Idea to the Public." Interesting facts relative to electric refrigeration were brought out by Fred T. Ealand, manager merchandising department, Oklahoma Gas & Electric Company. He suggested co-operation with the ice manufacturers.

Before adjourning the association elected Earl R. Ernsberger, Oklahoma City, as president; L. W. Scherer, Yale, as first vice-president, and H. L. Montgomery, Bartlesville, as second vice-president. W. R. Emerson, Oklahoma City, was again made treasurer, and E. F. McKay, Oklahoma City, was continued as manager.

Indianapolis' New Rates Are Promulgated

A new electric rate schedule, which will result in a total reduction to consumers in Indianapolis of approximately $328,000 for the present year, was ordered on March 11, effective as of March 1, by the Indiana Public Service Commission. The order is in conformity with an agreement made by Harley L. Clarke of Chicago, a special committee of the Indianapolis Chamber of Commerce and the commission on Jan. 10, when the merger of the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company into the Indianapolis Power & Light Company was approved. Under that agreement the reduction to domestic consumers was to be $315,000 annually and power users were to have a 10 per cent discount instead of the 5 per cent discount which has prevailed.

The new rate for class A or domestic consumers is 6½ cents net per kilowatt-hour for the first 50 kw.-hr. used each month, 6 cents for the next 50 hours, 5 cents for the next 100 hours and 4 cents for any excess over 200 hours a month. The net monthly minimum charge for industrial customers will be 80 cents plus 50 cents a month per kilowatt of capacity of each electric appliance exceeding 600 watts rated capacity.

Jersey City to Have a Three-Million-Dollar Substation

Work will be started soon on an electric switching station which the Public Service Electric & Gas Company has planned for the Marion generating station at Jersey City, N. J. It will cost approximately $3,000,000 and will be called the Hudson switching station. It will be the third of a new type of station to be built by the company, the others being at Trenton and Athenia, near Passaic. The Hudson station will distribute electric power generated at the Essex, Kearny and Marion stations so as to take care of the growing demands of Jersey City, Union City, Hoboken, Hackensack, Bayonne, Rutherford, Englewood, Edgewater, Leonia and other municipalities in Hudson and Bergen Counties. The site comprises about seven acres in the immediate vicinity of the Marion station.

The portion of the station to be completed this year will represent a capacity of 126,000 kw. The ultimate capacity is designed to be 216,000 kw. The station will contain six 85-ton transformers furnished by the General Electric Company. The oil circuit breakers are to be supplied by the Westinghouse Electric & Manufacturing Company, while the disconnecting switches and insulators, together with the steel supporting structure, will be made by the Railway & Industrial Engineering Company of Greensburg, Pa., a subsidiary of the American Brown Boveri Company. The first part of the Hudson station is scheduled to go into operation by Oct. 1.

In the Legislative Mill

Governor of Indiana Signs Two Bills—Indeterminate Franchise in Missouri—Commission for Florida?

ALTHOUH the Attorney-General of Indiana, in a long opinion, advised Governor Jackson that the Nedjl bill proposing to give the right of appeal to circuit or superior courts from acts of the Indiana Public Service Commission was unconstitutional and hence invalid, the Governor signed the bill, thus making it a law. The Governor also signed the Harlan bill, which seeks to empower the commission to disregard unnecessary attorney fees or other promotion expenses in public utility rate cases. The Attorney-General advised the Governor that this bill added nothing to the present law.

Leading officials of public utility companies of Illinois appeared on March 16 before a joint committee of the House and Senate considering pending bills for "home rule" of public utility companies by municipalities. These officials told the committee that passage of the "home rule" measures would seriously hamper the rendering of efficient public utility service to the people of the state and put obstacles in the way of reaching the farms.

Bills sponsored by the Missouri Association of Public Utilities have been presented to the Missouri General Assembly, now in session, to take from cities the right of granting franchises to public utilities and establish instead a state-controlled indeterminate franchise system throughout the state. The bills provide that hereafter any franchise granted by a municipality shall be of the indeterminate variety and further that any utility except a telephone company now under a city franchise may surrender it to the Missouri Public Service Commission and receive in return an indeterminate franchise. The only exception would be electric street railway systems, which could change to an indeterminate franchise only with the consent of the municipality affected. Another provision of the bills is that where a utility accepts an indeterminate franchise it gives formal consent to purchase by the city, if the city desires. If the company and the city cannot agree on a price for property to be thus taken over, the Public Service Commission's valuation becomes the purchase price.

The Nebraska House has recommended for indefinite postponement the Drusedow bill, which would have limited the charges to be made anywhere in the state for electrical energy to 7 cents a kilowatt-hour where it was used for lighting purposes and 3 cents where it was used for power. Mr. Drusedow gave notice that he would ask later to have this action set aside. The House committee on public utilities was on the point of recommending for indefinite postponement the bill that would have created a public utility, district out of 43 counties in eastern and southern Nebraska, to which it was proposed to supply electrical energy and water for irrigation purposes from diversion dams in the Platte River valley, when 200 farmers descended on Lincoln and insisted that the economic salvation of south-central Nebraska depends on the enactment of the law. They said that the private power companies were waiting to pounce upon the water appropriation rights in the proposed district. It is still regarded as doubtful, however, whether this bill will pass.

Rural residents in Wayne County and neighboring districts are understood to have inspired a bill introduced in the New York Legislature by Assemblyman Tellier providing for a pro rata assessment on rural users of gas and electricity to pay the cost of installing the service. It is maintained that this bill would do away with present inequality of cost assessment, which falls heaviest on pioneer promoters of cooperative installations and permits later subscribers to obtain service free of installation costs.

The bill to repeal the provision of the charter of the Susquehanna Power Company which prohibits it from transmitting electrical energy from Conowingo for sale in Baltimore has been passed unanimously by the Maryland House. A measure to require all power plants in Baltimore to be in charge of a licensed engineer, irrespective of motive power, which some maintain would apply to elevators and the smallest electric motor units or gasoline engines, seems certain of defeat. It is strongly opposed by engineers and business men.

By a vote of eighteen to none the Utah State Senate passed over the veto of Governor Dern a resolution of Senator Auerbach asking Congress not to pass the Swing-Johnson bill or similar legislation until there has been an equitable distribution of the waters of the Colorado River.

The regulation of power companies and power lines in Florida is likely to become one of the major issues at the 1927 session of the Legislature next month. Attempts will be made to place power companies under the supervision of a public utilities commission similar to the State Railroad Commission, which has charge of railroads and telephones. Whether a separate utilities commission will be created or a new department of the existing commission be set up is a matter of speculation.

Federal Radio Commission Holds First Meeting

Failure of the United States Senate to confirm two of the President's five nominees to the new Federal Radio Commission—O. H. Caldwell and H. A. Bellows—was, as predicted, met by recess appointments given to them by President Coolidge after the Congress had come to an end. This has enabled the board to function, and, although it will be hampered by another failure on the part of the Senate, consisting in the non-provision of funds, assistance from several government departments, which will loan the services of employees, will overcome this obstacle in part. The commission held its first meeting on Tuesday, March 15, at Washington and elected Judge E. O. Sykes of Mississippi as vice-chairman. Rear Admiral Bullard, the chairman, is expected back from China early in April.

Broad Refixturing Move

Sales Managers Show Increased Activity in Many Fields at N.E.L.A. Commercial Meetings

INCREASING activity on the part of the sales managers of the power industry, effected under Chairman Davidson's administration, was still further apparent in the concluding days of the spring meeting of the National Electric Light Association Commercial Section committees held in Chicago last week. The home-lighting committee reported a decision to organize a movement for refixturing the seven or eight million homes in America that are using obsolete equipment, the idea being for the central stations to take the leadership in a concerted industry movement. The wiring committee, heretofore devoted principally to the engineering aspects of wiring and matters relating to the code and company specifications, took action looking to the inauguration of a campaign to promote more adequate wiring installations, the details to be worked out in co-operation with the merchandising committee. Victor H. Tousley said in this connection that the first logical step to reduce the cost of wiring is to standardize on central-station service requirements to cut down the cost of entrance devices and meter fittings.

The general merchandising committee adopted an expanded program for concurrent advertising by the power companies and the appliance manufacturers. E. W. Lloyd urged the importance of safeguarding local trade relations in these campaigns by giving the dealer an opportunity to participate in special sales. M. C. Huse described a campaign in Philadelphia in which 2,000 convenience outlets were sold in one week. A price was arranged with the contractors of $5 for the first outlet and $3.95 for additional outlets and $15 for additional circuits. Payments are made at $2 a month. Selling is done by regular salesmen.

The refrigeration committee reported on two surveys, one on the cost of servicing and the other on advertising practice in selling refrigeration. These reports were turned over to the editing sub-committee for publishing. Both the merchandising and refrigeration committees discussed the question of testing appliances, possibly by setting up an N.E.L.A. laboratory. The industrial heating committee is preparing a salesman's manual which will be ready soon, as well as a correspondence course. The commercial cooking committee is organizing a cooking school to be held in Chicago in September.

The street and highway lighting committee is promoting better illumination of highways, and the effort is to be directed not only to the public and the municipalities but to the utility companies themselves. The present tendency, it was developed, is to use lamps of 1,000 lumens or larger, and many companies framing contracts on that basis report striking revenue increases with a strong preference for the 2,500-lumen lamps. Interest in electric signs, floodlighting and display windows is being revived by the new committee on electrical advertising.

Purchases and Mergers

Day & Zimmermann Acquire National Public Service—U. G. I. Merges Two of Its Iowa Properties and Seeks to Unite Its Pennsylvania Electric Companies

DAY & ZIMMERMANN of Philadelphia and their associates have acquired control of the National Public Service Corporation from the A. E. Fitkin interests, and Mr. Zimmermann will become president of the company. Mr. Fitkin will remain on the board. The most important properties controlled by the National Public Service are in New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Georgia and Florida. They include the Jersey Central Power & Light Company, Virginia Public Service Company, Tide Water Power Company, Florida Power Corporation, Municipal Service Company of Philadelphia and Eastern Shore Gas & Electric Company, with their numerous subsidiaries. Fuller details of this important transaction are contained under "Financial and Statistical."

A merger of the Central Iowa Power & Light Company and the Iowa Light, Heat & Power Company, representing public utilities valued at $30,000,000 and affecting 200 cities and towns in 34 central Iowa counties, is announced by Don M. Sterns, president of the Central Iowa Power & Light Company, by which name the merged properties will be operated, with headquarters at Fort Dodge. The properties of both these Iowa companies are a part of the holdings controlled by the United Gas Improvement Company of Philadelphia, which also owns the Sioux City Gas & Electric Company, not included in the merger. The transaction makes the Central Iowa one of the largest utility concerns west of Chicago. It was effected to promote effective management and improve service and will, it is predicted, assure ample and cheap power to the entire north Iowa section.

Two subsidiary companies of the United Gas Improvement Company whose combined value is $72,295,754 have applied to the Public Service Commission at Harrisburg, Pa., for approval of a merger of their resources. These companies are the Counties Gas & Electric Company of Norristown and the Philadelphia Suburban Gas & Electric. They made their original merger proposal in the term of Governor Pinchot, who refused to approve the plans on the ground that the rates of the Philadelphia Suburban Gas & Electric Company were too high.

The Turners Falls (Mass.) Power & Electric Company has thus far deposited 82,000 of 100,000 outstanding shares with the Merchants' National Bank of Boston, to be exchanged for shares of the Western Massachusetts Companies, the holding company organized in January. Similar action has been taken or agreed to by the Greenfield, Pittsfield, Amherst, Easthampton, Ludlow and Agawam electric utilities,

Utility Company Office Buildings Going up or Being Enlarged in Many Cities

ABOVE are shown views of three office buildings devoted to the use of public utility companies in three sections of the country. On the left is the new building of the Consumers Power Company at Jackson, Mich., scheduled for completion in May. This building, eleven stories in height, of reinforced-concrete frame and brick exterior, is erected on the site of the old general office, and during the period of construction the Consumers organization, Commonwealth Power Corporation, Hodenpyl, Hardy & Company and United Appliance organizations have been scattered about the city in temporary quarters. They will be brought together in the new structure, with the exception of the meter laboratories and shops, which occupy the new service building, about four blocks from the main building.

The center picture is an architect's drawing showing the ultimate appearance of the new office building of the Oklahoma Gas & Electric Company at Oklahoma City, which will be started within the next month or two and completed by Jan. 1, 1928. The building will first be a six-story structure, but will have a foundation for twelve stories, to be added when needed.

On the right is a view of the new fourteen-story office building and headquarters of the United Gas Improvement Company at Broad and Arch Streets, Philadelphia, now about completed. With the original U.G.I. home, to which it is joined, it is one of the largest buildings exclusively devoted to public utility work in the United States, having a total floor space of 216,000 sq.ft. The steel frame is designed to permit the erection of seven additional stories when they are required. The building will house 1,400 employees concerned in the carrying on of gas and electric companies.

Not a few other new office buildings, under way, just finished or being reconstructed, have been noticed in the ELECTRICAL WORLD in recent months—those in New York City, Rochester and St. Louis being respective examples. The Penn Central's new building at Allentown was illustrated in these columns on Feb. 5. A new building for the Utica (N. Y.) Gas & Electric Company will be ready for occupancy in May.

the last two being owned by the Turners Falls company. The policy and identity of the individual companies will not be changed in any way.

The New York Public Service Commission has approved the purchase of the common stock of the Northern Wayne Electric Light & Power Company of Wolcott, N. Y., by the Rochester Gas & Electric Corporation, which is said to have had an option on the stock for some time.

The Wisconsin Railroad Commission has approved an agreement between the village of Randolph and the Wisconsin Power & Light Company for sale of the municipal electric plant at $39,500. The question will be submitted to vote.

Negotiations have been completed for the purchase of the Lakota (N. D.) light and power plant by Drake-Jones & Company of Minneapolis. J. P. Larson, who acquired the plant fourteen years ago, has been retained as manager.

The town of White River, S. D., has voted to sell its municipal hydro-electric plant to the Dakota Public Service Company for $45,000. At the election 134 votes were cast, with only five votes against the sale.

Sale of the municipal electric plant at Plains, Kan., to Dwight Chapin, Jr., of Wichita, has been announced. Plains will be served from a high-tension transmission line from Copeland, Kan., under a 20-year franchise. Negotiations are under way for the purchase by the Rossville (Kan.) Electric Light, Ice & Elevator Company of the municipal distribution systems in the towns of Willard and Silver Lake, to which the Rossville company has been supplying energy.

The Mississippi Public Service Company has presented a tentative offer for the municipal light and water plant to the City Council of Greenwood, Miss. The price suggested is $855,000.

The Portland Electric Power Company has offered to purchase the transmission system of the Molalla Electric Company, which serves a limited district in Clackamas County with energy purchased from the Portland company. The transmission system was valued by the Oregon Public Service Commission at $60,000 for rate-making purposes.

City Solicitor of Holyoke Would Tax City Plant

City Solicitor H. J. Lacey of Holyoke, Mass., has submitted an opinion to the Mayor in which, pointing to the numerous benefits derived by the municipal Gas and Electric Department from the city, he declares that the time has apparently arrived for an amicable and permanent understanding whereby the municipal plant will bear its proportionate costs of these benefits. "It is not just that the taxpayers of this city should be forced to bear more than their share of the burdens of government in order that the department customers may obtain extra benefits," City Solicitor Lacey says, adding that "it is possible to adjust the rights and duties so that all will stand a proportionate share of both the benefits and the burdens."

Briefer News

Wichita, Kan., Gets Underground Service in Downtown Section.—The Kansas Gas & Electric Company has completed an underground conduit at Wichita, in the downtown section, at a cost of $1,000,000. The cables are now being strung by the company, and in a short time the whole downtown section will be served by underground distribution.

Kenova-Portsmouth (W. Va.) Interconnection Nearly Completed.—Imminent completion of a 30,000-volt power line from Kenova to Portsmouth, W. Va., has just been announced by the Appalachian Power Company. The new line will connect Portsmouth with the Philo plant of the Ohio Power Company, which, like the Appalachian Power Company, is owned by the American Gas & Electric Company.

Jury Awards $20,000 to California Farmer for Riparian Rights.—A jury at Redding, Cal., has awarded Morton R. Crum, farmer, $20,000 damages against the Pacific Gas & Electric Company for depriving him of riparian water rights along the Fall River. Crum asked for $43,000. The case is viewed as a forerunner of suits by other residents of the district against the company, totaling $800,000.

Jonesville, Ind., Catches Up.—Kerosene versus electricity for street lighting is the issue to be decided by voters of Jonesville, Ind., at an election this month. Sentiment is said to be unanimous for issuing bonds to pay for electrical equipment. For many years kerosene lamps have been lighted at dusk and extinguished at dawn. According to the plans, electricity will be provided by the H. F. Clevenger Electric Company of Columbus, Ind.

United States to Ask Supreme Court to Determine Power Rights on Rivers.—Because of the controversy which has arisen through the claim of the State of Alabama that it owns outright the water power of rivers within its boundaries, including Muscle Shoals, and the claim of Utah to the bed of the Colorado River inside of the state limits, the United States Department of Justice plans a suit to be carried to the Supreme Court of the United States to secure a final decision on this important question.

Important Maine Interconnection Planned.—President Walter S. Wyman of the Central Maine Power Company has announced that during the spring of this year an interconnecting transmission line with a capacity of 20,000 kw. will be built between the systems of the Central Maine company and the Bangor Hydro-Electric Company. The completion of this line will provide an interlocking network of power systems serving Maine from the Calais district on the northeast to the Portland-York district on the southwest. There are only three important reserve steam plants on these systems, the predominant power supply being hydro-electric. The completion of the Central Maine-Bangor tie line will enable the operating companies to take advantage of the diversity of flow and loads in the valleys of the Penobscot, Union, Kennebec, Androscoggin and Saco Rivers on a scale hitherto impossible.

Foshay Company Builds New Hydro Plant in Wisconsin.—The People's Wisconsin Hydro-Electric Company, which was made a part of the W. B. Foshay holdings last year, has just completed construction work on a three-hundred-thousand-dollar dam and power plant on the Namekagon River, near Spooner, Wis. It will distribute 2,000 hp. to about forty towns and cities in the northwestern part of the state.

North Central Division, N.E.L.A., Sectional Meetings.—A sectional meeting of the North Central Geographical Division was held in Albert Lea, Minn., on March 16. Benjamin A. Bearnes, manager of the Interstate Power Company at Albert Lea, was the host. The next meeting will be at Sioux Falls, S. D., on April 13, at the Carpenter Hotel. O. A. Rofelty, manager of the Northern States Power Company at Sioux Falls, will be the host.

Lawrence Gas & Electric Company Dedicates Service Building.—Henry I. Harriman, president of the New England Power Association, which now controls the Lawrence (Mass.) Gas & Electric Company, and President Fred H. Sargent of that company were speakers at a banquet held last week to dedicate the new service building of the Lawrence utility. Three hundred and sixty employees filled the new building, and elaborate decorations drew much praise from the local press.

Newfoundland and Quebec Dispute Over Ownership of Falls in Labrador.—As a result of the recent decision of the British Privy Council awarding to Newfoundland a big area of the mainland of Labrador, a dispute has arisen as to the ownership of the famous Grand Falls on the Hamilton River, which are capable of producing immense water power. The judgment, while generally supporting Newfoundland's claims to the territory in dispute, fails to mention the falls. Quebec authorities are contending that the falls remain the possession of that province, but the matter may again have to be referred to the Privy Council for a specific interpretation on this point. These falls are said to be the largest in the world. Their height is nearly 800 ft.

Plain and Fancy Lighting in New Orleans.—Provision for an increased number of lamps in the outlying sections of New Orleans will be made in the new lighting contract to be entered into between the city and the New Orleans Public Service, Inc., when the old contract, made nearly ten years ago, expires early next year. Street illumination during the 1927 carnival season, which ended recently, surpassed all previous efforts in that direction.

The city's contribution along Canal and St. Charles Streets, routes of the various brilliant pageants, was very elaborate, requiring countless thousands of lamps which were strung criss-cross above the street-car wires at intervals of 20 ft. for a distance of about 2 miles. The stringing of the lamps required more than two weeks' labor by a special crew from the New Orleans Public Service, Inc. Among outstanding private illuminations were those of the Public Service Building and the Saenger Theater in Canal Street.

Chicago's Street-Lighting Record.—No large city in America has kept pace with Chicago in the last three years in improving its municipal lighting system, according to a report made to the Mayor by John T. Miller, Commissioner of Gas and Electricity. Since July 1, 1923, the report stated, the city has spent $6,091,000 for street lamps, installing more than 25,000 new units, covering 35 square miles of territory and 860 lineal miles of streets.

Vermont University Is Twenty-eighth to Establish Short Meter Course.—The University of Vermont at Burlington is the latest educational institution to announce a special four-day course for electric metermen. This will be held April 5 to 8 inclusive, under the direction of Prof. Leonard P. Dickinson. The number of these short meter courses throughout the country is continually increasing, and in the present school year, the meter committee of the N.E.L.A. says, there will be 28 such courses throughout the United States.

Falls of Ohio Plant May Produce Energy This Year. — The Louisville Hydro-Electric Company reports that construction work on the new power plant at the Falls of the Ohio, despite high water and flood stages in the river over part of the construction period, is right up to schedule time. Work on the dam itself, which is being built by the company and government jointly, is behind, but if it is possible to get in two weeks' steady work before April 1, it will catch up fairly well. Installation of machinery is to start in early April, if the present building schedule is continued, and with good weather conditions and water stages over 1927, it is said to be possible that the first units will produce energy by the close of the year.

Virginia Electric & Power Company Expands.—Electric service was commercially established on Feb. 27 in Edenton, N. C., by the Virginia Electric & Power Company, which since its acquisition by the Engineers' Public Service Company a year or more ago has been steadily extending its transmission lines from its existing power stations into northeastern North Carolina. The present expansion program, which will near completion this year, will add over 200 miles to the transmission lines and make abundant power available in about twenty communities, many of which have been without an adequate supply.

Good Site for New Skagit River Dam Reported Found.—With the finding of solid rock 83 ft. beneath the bed of the Skagit River at Falls Creek, an admirable site is indicated for a third and last dam in the city of Seattle's big hydro-electric project, Superintendent of Lighting J. D. Ross announces. Falls Creek is about half way between the power house near Newhalem and the intake of the tunnel. Mr. Ross estimates the cost of a masonry dam at Falls Creek at $3,112,500, with an additional $787,000 for a second tunnel, making a total of $3,900,000. With the new dam, he says, there would be sufficient pressure in the flow through the tunnel to enable the two generators now in the Newhalem plant to produce 37,500 additional horsepower.

A Quebec Water-Power Project Attacked.—Strong opposition has developed in the Quebec Legislature to a bill in the interest of the Beauharnois Light, Heat & Power Company which gives that company the right to build a feeder canal for power development in the Lake St. Louis district of the province. Opponents of the measure maintain that the company's plans, if carried out, would spell disaster for the water-power plants now in operation in the district. Sponsors of the bill say that the company wants to develop 450,000 hp.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD for Jan. 1, page 80.]

Northwest Electric Light and Power Association, Accounting Section—Gasco Building, Portland, Ore., March 21. W. L. Fitzpatrick, Mountain States Power Company, Tacoma, Wash.

Southeastern Division, N.E.L.A.—Peabody Hotel, Memphis, Tenn., April 13-15. C. M. Kilian, 404 Wynn-Claughton Bldg., Atlanta.

American Institute of Electrical Engineers — Middle Eastern District, Bethlehem, Pa., April 21-23; Northeast District, Pittsfield, Mass., May 25-27. F. L. Hutchinson, 36 West 39th St., New York.

Southwestern Division, N.E.L.A.—New Orleans, April 26-29. S. J. Ballinger, San Antonio Public Service Company, San Antonio, Tex.

Southwestern Public Service Association — New Orleans, April 26-29. E. N. Willis, 403 Slaughter Bldg., Dallas, Tex.

Nebraska Section, N.E.L.A.—Grand Island, Neb., April 27-28. H. M. Davis, 1519 O St., Lincoln.

American Electrochemical Society — Benjamin Franklin Hotel, Philadelphia, April 28-30. Colin G. Fink, Columbia University, New York.

Electrical Supply Jobbers' Association —Greenbrier Hotel, White Sulphur Springs, W. Va., May 2. Franklin Overbagh, 411 South Clinton Street, Chicago.

Missouri Association of Public Utilities —Cape Girardeau, May 5-7. F. D Beardslee, 315 North 12th St., St. Louis.

Middle West Division, N.E.L.A. — Topeka, Kan., May 18-20. H. M. Davis, 1519 O St., Lincoln, Neb.

Canadian Electrical Association—Clifton Hotel, Niagara Falls, Ont., May 25-27. J. B. Woodyatt, Southern Canada Power Company, Montreal.

National Electric Light Association—Atlantic City, N. J., June 6-10. Paul S. Clapp, 29 West 39th St., New York.

Faraday's Original Coils Received by Franklin Institute.—The Franklin Institute at Philadelphia has received the original iron coils used by Michael Faraday in pursuing his electromagnetic researches a hundred years ago. The coils, as previously reported, are a gift to the Franklin Institute from the Royal Institute of Great Britain. Dr. William C. L. Eglin, president of the Franklin Institute, in formally accepting the gift, declared that the coils were "priceless from a scientific standpoint and were landmarks in the research into the underlying principles of electromagnetic induction. Faraday discovered electromagnetic induction," he said. "He conducted his experiments in 1831, coincidentally with Joseph Henry. Several coils made by Henry are the property of Princeton University."

Another Arizona Body Tackles the Colorado River Problem.—Still another Arizona body is to tackle the problem of the Colorado River. The Arizona Colorado River Development Association has been organized at Phoenix with the backing of the Phoenix Chamber of Commerce. It is proposed to call a convention in Phoenix of representatives of all sections of the state and to establish a permanent organization, to co-operate with the federal government, to offer a plan of union with California and Nevada and to forward early construction of lower-river works of flood control, reclamation and power development.

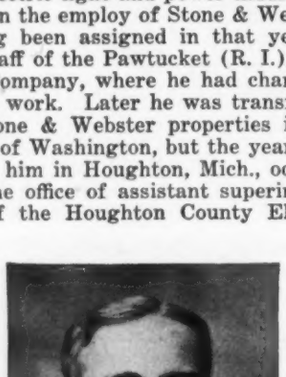
Rival Companies Contest Arkansas Territory.—A fight over territory is going on in Arkansas between the Southern Edison Company, a subsidiary of the General Power & Light Company of Chicago, and the Arkansas Light & Power Company. The latter is building a line from Searcy to Heber Springs, which has reached Pangburn, where the Southern Edison has a franchise. The Southern Edison is seeking to restrain its rival from operating the new line, although the competitor denies any intention to attempt to serve Pangburn. On its part the Arkansas Light & Power is trying to block the proposed sale of the Batesville municipal plant to the General Power & Light Company.

Competitive Situation in Maryland.—Following several months of dissension between Havre de Grace, Md., and the Northern Maryland Electric Company, now supplying that city with power (see ELECTRICAL WORLD for Jan. 15, page 167), Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, announces that his company will extend its lines to Havre de Grace, accepting an invitation from the Havre de Grace City Council to do so. What action the Public Service Commission will take is uncertain. Mr. Wagner is reported to have declined to say whether or not he would file an application with that body. The Northern Maryland company will resist the invasion.

Men of the Industry

Otto Snyder Elected Vice-President of Adirondack Company

Otto Snyder, general manager of the Adirondack Power & Light Corporation, Schenectady, N. Y., was elected to the position of vice-president at the recent annual meeting of stockholders. Mr. Snyder entered upon his career in the electric light and power industry in 1908 in the employ of Stone & Webster, having been assigned in that year to the staff of the Pawtucket (R. I.) Electric Company, where he had charge of meter work. Later he was transferred to Stone & Webster properties in the State of Washington, but the year 1913 found him in Houghton, Mich., occupying the office of assistant superintendent of the Houghton County Electric



OTTO SNYDER

Light Company, of which he subsequently became superintendent.

It was at this time that Stone & Webster took over control of the Adirondack Electric Power Corporation, with headquarters at Glens Falls, and Mr. Snyder was transferred there to engage in the study of rates and other commercial activities. When Stone & Webster relinquished control in the fall of 1917 he remained with the Adirondack organization. In 1921 he was appointed general superintendent of the Adirondack Power & Light Corporation in charge of all engineering, construction, plant operation, transmission and all matters pertaining to power supply, continuing to perform these duties in addition to assuming broader responsibilities as manager of power resources in 1925. Mr. Snyder advances to a vice-presidency in the company from the position of general manager. He is a native of St. Louis and a graduate of Cornell University in electrical engineering.

M. D. Field, general auditor of the California - Oregon Power Company, San Francisco, has been elected secretary of the company to fill the vacancy caused by the appointment of D. G. Tyree to the position of manager of the investment department. Mr. Field has been a member of the California-Oregon organization for nearly four and a half years and is well qualified to assume his new duties, which will be combined with those of his present position of general auditor. Formerly he was affiliated with the Pacific Gas & Electric Company, the J. G. White Engineering Company and other utility and construction companies.

New Vice-Presidents Named for Electric Bond & Share

A. S. Grenier and P. B. Sawyer have been elected additional vice-presidents of the Electric Bond & Share Company and of the Electric Bond & Share Securities Corporation. C. E. Groesbeck, for several years a vice-president of the Electric Bond & Share Company, was made the executive vice-president of the company and of the Electric Bond & Share Securities Corporation.

Jacob F. Schoellkopf, chairman of the board of directors of the Buffalo, Niagara & Eastern Power Corporation, Buffalo, N. Y., sailed for Germany March 16 aboard the Hamburg-American liner *Deutschland*.

Carl F. Wurtzbach, vice-president and manager of the Lee (Mass.) Electric Company, has been elected a member of the New England Council upon the recommendation of the Western Massachusetts Chamber of Commerce.

T. G. Bradley has been appointed general superintendent of the California-Oregon Power Company, a newly created position, with headquarters at Medford, Ore., according to an announcement made by P. O. Crawford, vice-president and general manager of the company. Mr. Bradley has been associated with the company and its predecessors for 28 years.

Matthew S. Sloan, president of the Brooklyn Edison Company, has been named as Brooklyn's candidate for director of the Natural Resources Production Department of the Chamber of Commerce of the United States. The election will be held in May.

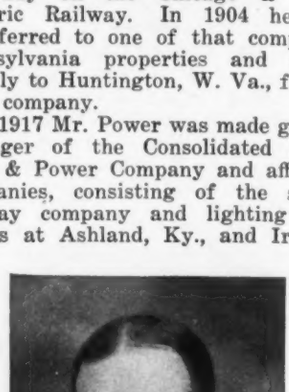
Paul Kendall, for the last four years associated with the Great Bend (Kan.) Water & Electric Company, which is controlled by the A. E. Fitkin interests, has been made manager of the Hoisington Electric & Ice Company, also a Fitkin property. He succeeds C. V. Sebaugh, recently transferred to Ironton, Mo., as manager of a group of properties of the Arkansas-Missouri Power Company.

John J. Flynn of Burlington, Vt., has been elected a member of the board of directors of the W. B. Foshay Company of Minneapolis. For half a century Mr. Flynn has been actively engaged in the development of Vermont. He built the hydro-electric station at Vergennes in 1893 and also the Burlington Traction Company system. Other Vermont interests of Mr. Flynn include large holdings in the granite quarries, in timber and in the largest talc mine in the country.

W. R. Power New President of Kentucky Association

W. R. Power, who was elected president of the Kentucky Association of Public Utilities, as announced in the Feb. 26 issue of the ELECTRICAL WORLD, entered upon his career in the manufacturing branch of the electrical industry, when he affiliated himself with the testing department of the General Electric Company at Schenectady. Later he removed to Joliet, Ill., as an employee of the American Railways Company on the Chicago & Joliet Electric Railway. In 1904 he was transferred to one of that company's Pennsylvania properties and subsequently to Huntington, W. Va., for the same company.

In 1917 Mr. Power was made general manager of the Consolidated Light, Heat & Power Company and affiliated companies, consisting of the street-railway company and lighting companies at Ashland, Ky., and Ironton,



W. R. POWER

Ohio. The holding company was taken over three years ago by the American Gas & Electric Company and is now known as the Appalachian Electric Power Company, Huntington district. During 1926 Mr. Power served as president of the East Central Geographic Division of the N.E.L.A.

Obituary

M. G. Linn, vice-president and general manager of the Iowa Power & Light Company and the Des Moines Electric Light Company, died in Des Moines March 12.

James T. Boustead, one of the pioneers in the electrical industry in Minneapolis, died at his home in that city Feb. 28 in his sixty-seventh year. He was the first general superintendent there of the Brush Electric Company, now the Minneapolis General Electric Company, having installed the first dynamo in the plant in 1881. A 250-ft. light mast to serve as a beacon was also installed by him in the earlier days of the city. Mr. Boustead was born in England in 1859 and came to the United States in 1876. He organized the Electric Machinery Company in Minneapolis in 1892 and for many years served as its president. Subsequently he formed the Boustead Electric & Manufacturing Company.

Recent Court Decisions

Appeal from Commission Ruling Must Be Based on Statement of Fact.—Asserting the right of a public utility company to a hearing when a rival company files an application for a certificate and its right of appeal from a commission decision, the Supreme Court of Kansas has held, in Kansas Gas & Electric Company vs. Commission, that its appeal must be based on a statement of fact and not merely on an allegation that the commission's order was "arbitrary, unlawful and unreasonable." (251 Pac. 1097.)*

Utility Temporarily Estopped from Terminating Contract Cannot Recover Excess Cost of Service When Bills Were Receipted.—In Jackman (representing the Bowersock Mills & Power Company) vs. Kansas Electric Power Company suit was brought to recover the alleged excess cost of electricity furnished to defendant over the amount paid in accordance with the terms of a contract in two and a half years during which the plaintiff was conducting a court fight, finally successful, to abrogate the contract in accordance with certain of its provisions. The Supreme Court of Kansas found for the defendant, since the sums paid were those for which bills were rendered and the bills were receipted as in full settlement of the account. It was also held that the valuation of the plaintiff's plant when it was taken over by defendant in January, 1922, should be its value when the contract was annulled and the right to acquire the plant sustained, which was July, 1919. A third finding was that storage batteries installed to equalize surges in current caused by a street railway system were part of the plant. (251 Pac. 431.)

Valuation Must Reflect Reproduction Cost Less Depreciation.—Applying to an action of the Waukesha Gas & Electric Company against the Wisconsin Railroad Commission, brought to upset gas rates fixed by the defendant, the principles laid down by the United States Supreme Court in McCardle vs. Indianapolis Water Company, the Supreme Court of Wisconsin said: "In the McCardle case a valuation made substantially like that of the commission in the present case was set aside by the court, because in view of the great advance in prices during and after the war it did not correctly reflect the actual value of the property as of the time the valuation is made, which is the date of the order fixing the rate, and the probable value for some years to come. A valuation which does not as to the tangible property substantially reflect the then cost of reproduction less depreciation does not meet the requirements. The utility is entitled to the present fair value of its property as a basis for rate making. Hence, where there has been a period of rising prices for many years, original cost plus cost of additions does not correctly measure the present value. Such a method may form the main basis of a valuation during a period of fairly stable prices, but it does not as applied to prices from 1912 and earlier down to 1922. Since the basic result to be reached is the present and near-future fair value of the property, any method that will accomplish that result is a proper method. It is doubtful if any method will accomplish such result unless it substantially reflects or agrees with present or recent reproduction cost less depreciation. The method employed by the commission in the instant case does not do so, and under the federal rule referred to must be set aside as confiscatory and unreasonable."

Rights of Riparian Owners. — In denying a rehearing to the Southern California Edison Company in the Herminghaus suit to prevent diversion of the waters of the upper San Joaquin River and its tributaries, as already reported in the news columns of the ELECTRICAL WORLD (Jan. 29, page 266, and Feb. 12, page 371), the Supreme Court of California handed down a long decision. Three out of the seven judges voted for a rehearing. Some of the findings of the majority follow: Riparian owners are invested with rights in entire flow of waters, including seasonable accretions resulting from melting of snow in mountains. Riparian owners' utilization of waters of river and flow and underflow and overflow thereof for growing of natural grasses and reclaiming alkali land is a reasonable use. An upper riparian owner along river and tributaries thereof is entitled to the benefit of whatever reasonable waste or diminution of water occurs during the course of reasonable exercise of its riparian rights and is entitled to make appropriate use of waters of the river for development of power and electrical energy, but the upper riparian owner as such has no right to reservoir and indefinitely divert and detain the waters of the river to such an extent as would practically effectuate a withdrawal of waters from a large portion of riparian owners during certain periods in each season. Appropriation of water by a riparian owner diverts no existing private right and merely gives preference over subsequent appropriator or diverter who takes under no other right or title. The Water Commission act relative to declaring waters which may not be needed for useful and beneficial purposes on riparian lands to be public waters has no application in a case where waters are being applied to useful and beneficial purposes on riparian lands. An upper riparian owner cannot predicate asserted right as lessee and licensee of federal government to superior use of river waters in aid of navigation where record shows that contemplated use requires sequestration, storage and diversion of a very large quantity of waters from the river to whose flow claim is made. (252 Pac. 607.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Burden of Preparing Its Own Case Is on Utility Company.—Declaring that utility companies must develop their own cases, the California Railroad Commission granted an application of the Great Western Power Company for permission to issue $1,000,000 of 7 per cent preferred stock, but denied the application of the company to issue $2,500,000 of common stock at $50 a share, on the ground that the evidence in favor of the sale of the stock at such a figure was insufficient. The commission said: "It is not incumbent upon the commission's representatives to develop an applicant's case. The practice of some applicants to ask their witnesses a few perfunctory leading questions and then dismiss them with the suggestion that if the commission desires any additional information, its representatives may ask the questions, does not meet with the approval of the commission. We expect an applicant to make such affirmative showing in support of its requests as will warrant the commission to make the findings it is expected to make, and not impose on the commission the duty to make such showing either by cross-examination or direct testimony."

Company Not Forced to Serve Applicant in Remote Quarter of Village.—The Wisconsin Railroad Commission has dismissed a complaint in which a resident of Forest Junction accused the Wisconsin Public Service Corporation, the Forest Junction Light & Power Company and the F. Paustian Milling Company of refusing him electric service. The commission ordered the Forest Junction company to cease doing business, and a permit was issued to the Wisconsin Public Service Corporation permitting the distribution of energy in that community on the terms filed with the commission. Electric service in the unincorporated village of Forest Junction was inaugurated eight years ago by an association of residents organized as the Forest Junction Light & Power Company, who executed a 50-year contract with the F. Paustian Milling Company of Brillion, under the terms of which the milling company built a power line to Forest Junction and installed a pole-line system in the village. The milling company, however, agreed to furnish no energy excepting on order of the Forest Junction company, which exacted a fee of $100 from every customer. The milling company disposed of its business to the Wisconsin Public Service Corporation in 1923, and J. F. Otto, who had requested service at a remote location, filed complaint with the commission alleging that both the milling company and the public service company practiced discrimination in refusing to supply him and that the Forest Junction company, in controlling the distribution of electricity in the village, was illegally operating as a public utility.

Financial and Statistical

Utilities Active on Curb
Common Stocks Up Marginally
Bonds Firm—Money Easy

LAST week's trading in the public utility securities shows indications of reviving activity. Operations were especially active on the curb market, where several new high points were reached, as in the case of Southern Cities Utilities common and certificates, Alabama Power preferred and Consolidated Gas of New York. Other strong features were American Gas & Electric common, Penn-Ohio Edison prior preferred and New England Power preferred. Cities Service common is working upward after its recent decline.

On the big market power and light securities have held firm, with a number of slight advances, notably Edison Electric Illuminating of Boston and Southeastern Power & Light. There were also a number of marginal losses, so that the average did not change materially.

Continued strength is evident in the public utility bonds, with money rates reduced to 3½ per cent. Liberty bond conversion and the falling due of income taxes appear to have made no appreciable difference in the money situation. The ELECTRICAL WORLD index of ten representative power and light bonds made a further fractional rise to 102.8, against 98.9 this week last year. The situation seems thus accurately summarized by a current investment market letter: "Interest rates and commodity prices—the two primary factors in fixing bond prices—are distinctly favorable, both showing continued easing tendencies, thus promising well for an extension of existing price levels in the bond market."

Day & Zimmermann Buy National Public Service

The passing of control of the National Public Service Corporation from A. E. Fitkin & Company to the Day & Zimmermann interests marks one of the most important recent transactions in the power and light industry. Day & Zimmermann and their associates now control an operating group with annual earnings of more than $40,000,000 and with capitalization in excess of $200,000,000.

The National Public Service Corporation was organized and has been built up to its present strength by A. E. Fitkin, who will remain on the new board. It has gross receipts of more than $27,000,000 and serves an aggregate population in excess of 2,000,000. The principal companies under its control include the Jersey Central Power & Light Company, Virginia Public Service Company, Tide Water Power Company, Florida Power Corporation, Eastern Shore Gas & Electric Company and the Municipal Service Company. These properties are in New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Georgia and Florida. Through the companies named, 250,000 customers are served with electric power, gas, water and steam, nearly 200,000 of the total being power customers. In addition, the system furnishes electric railway and bus service in sections of Pennsylvania, Ohio, Virginia and North Carolina. The electric systems have an installed generating capacity of 237,896 hp. and 1,968 miles of high-tension transmission lines.

One of the most interesting features of the transfer is the increased public utility control which it places in the hands of the Day & Zimmermann group. Mr. Zimmermann and his associates have long experience in the public utility field, and the addition of so large a group of properties adds greatly to their importance in the industry. Mr. Zimmermann becomes president and Mr. Floyd Woodcock vice-president of the National Public Service Corporation.

Urge Change in Capitalization Laws

Massachusetts Department of Public Utilities Hears Plea for Elimination of Premium Law and Capitalization of Existing Premiums

IN RESPONSE to a legislative order, the Massachusetts Department of Public Utilities has lately been hearing advocates of revision of the capitalization laws of the Bay State, and it will soon present a report with its recommendations to the General Court. At the closing hearing in Boston the commission was addressed by Carl D. Jackson, general counsel National Electric Light Association, New York, and Prof. Winthrop M. Daniels of Yale University, on behalf of leading electric and gas utilities of Massachusetts, which favored the elimination of the premium law and the capitalization of existing premiums and also, to a certain degree and subject to commission regulation, the capitalization of earned surplus.

Mr. Jackson called attention to the fact that, in spite of the existence of the premium law in Massachusetts for so many years, similar legislation had never been adopted in any other state and that it is universally recognized that a law requiring stock to be sold at premium over its par value is harmful alike to the companies and to the customers. He stated that the effect of a premium law is to increase the issue price of stock in periods of prosperity and low interest rates, regardless of whether the price of issue is justified or not. The issue price is affected not only by low interest rates but sometimes by high earnings due to rates which may not be justified. The result of the law is that, without fault of the commission or of the company, an effective par value in excess of real par value is established. The public or stockholder who bought this stock at the high issue price established by the commission is bound to rely on the order and to expect a dividend rate which will maintain the stock at the issue price. With increasing rates on money and depressed conditions in security markets a higher return is necessary to maintain the stock at the price the commission has established. This tends to increase dividends.

Mr. Jackson suggested that the remedy is to allow, first, the capitalization of premiums, which is merely allowing the issue of stock to a par value representing the money which the stockholders have actually put in and which in any other state but Massachusetts would have been capitalized at the time of issue of the stock. For instance, if the stockholders had paid into the company an average of $150 a share for their stock, of which $50 represented premiums, each stockholder would receive one-half share for every share now held and the old and new securities combined would represent just exactly what the stockholder had invested.

The capitalization of premiums would take nothing from the public. It would operate equally between the stockholders, and it would create no basis for either increasing or decreasing the rate base. Properly understood, it would in part eliminate misunderstanding as to what the company was earning. In the case of some companies which had no premium account or small premium account, capitalization of premiums would not solve the whole problem, but this was no reason why a law should not be passed allowing such capitalization.

The next step beyond capitalization of premiums is a proper capitalization of earned and reinvested surplus. This is allowed by the Interstate Commerce Commission and by many states, and guarded by order of the commission it is a proper method of adjusting capital. Earned surplus built up over a period of many years and reinvested in plant is, under the decisions both in the Fall River Gas Works case (214 Mass.) and of the United States Supreme Court, held to be the property of the corporation which the directors have a right to distribute to the stockholders by way of dividends. The corporation, if the directors wish, can distribute this and then turn around and issue stock for extensions and improvements, and there is no reason why within proper limits

the directors should not capitalize it. To attempt to prevent capitalization of surplus is merely to force larger dividends than might otherwise be the case.

Like the capitalization of premiums, capitalization of surplus takes nothing out of the public. It in no way changes the rate base, whether the rate base be the value of the property or, as some seem to think, the so-called Massachusetts doctrine of "honest and prudent investment," whatever that may mean.

Professor Daniels, former member of the Board of Public Utility Commissioners of New Jersey and for nine years a member of the Interstate Commerce Commission, discussed methods of regulating rates and security issues in other jurisdictions. He emphasized the fact that the amount and market value of securities has little connection with the determination of the rate base and that these occupy only a subordinate position and cannot alter the essential base upon which the validity of rates rests.

He stated that fixing of the issue price upon new issues at a figure which was intended to be the market or value of the shares has proved to be an impossible task for either the company of the Massachusetts department, as the market price was frequently impossible of determination; further, that fixing a high market price or premium on the issue of stock has a tendency to "estop the department from attempting to lower unreasonable rates where such rates are found to be necessary to sustain the market price of the shares" at or near the price fixed by the department, thus "impairing substantially the power of the state to regulate rates."

To capitalize premiums and thereafter issue stock at a true par value would be to widen the market for the shares by removing the prejudice entertained by investors against a high premium, thereby enabling Massachusetts securities to compete with those of "foreign" companies. This would lessen the disparity between the rate of dividend and the real rate of return and thus remove popular misunderstanding and prejudice, and it would relieve the commission of the intrinsic difficulty of setting a price for the stock which might in future turn out to be unjust either to the investor or to the public.

New Capital Issues

First mortgage 5 per cent gold bonds of the Utah Power & Light Company were offered the investing public during the week ended March 17, the price being 98 and interest, to yield about 5.18 per cent. The issue involved a total of $2,000,000. Upon the completion of this financing there will be outstanding with the public mortgage bond amounting to $33,347,000.

To provide additional working capital for the financing of the rapidly growing business and for additions to plant the Century Electric Company recently offered first mortgage and secured 5½ per cent gold bonds at prices to yield from 5 per cent to 5¼ per cent, according to maturity. These bonds, dated March 1, 1927, are due serially from March 1, 1930 to 1933.

The Abitibi Power & Paper Company, Ltd., issued four-year 6 per cent gold coupon notes, amounting to $4,000,000, the price being par and accrued interest to yield 6 per cent.

First mortgage 20-year 6 per cent gold bonds, series A, of the Texas-Louisiana Power Company, totaling $1,000,000, were issued at 100 and accrued interest to yield 6 per cent.

A new offering was made by the American Utilities Company in the form of first lien and refunding gold bonds, series A, totaling $1,250,000, the price being 100 and interest, yielding 6 per cent.

Georgia Merger Will Further South's Industrialization

Completing the consolidation of a group of central Georgia utilities into the Georgia Power Company, last week's forty-five-million-dollar bond flotation marks a significant step in the industrialization of this section of the South. More than 135 municipalities in the northern and central part of the state are served.

This piece of financing, which is the largest in the power and light industry so far this year, results in the retirement of more bonds of predecessor companies totaling $25,000,000, most of which bear interest at from 6 to 7 per cent. In this way the capital structure of the new company is very greatly simplified and an important saving in carrying charges is effected as well. On completion of the present financing the company will have outstanding, in addition to its funded debt, 285,445 shares of six-dollar preferred stock, 450,000 shares of six-dollar second preferred and 2,000,000 shares of common stock, all of no par value.

Companies included in the merger are the Athens Railway & Electric Company, Georgia Railway & Electric Company, Georgia Railway & Power Company, East Georgia Power Company, Rome Railway & Light Company and the Georgia Power Company, which includes properties formerly belonging to Athens Gas Light & Fuel Company, Georgia Southern Power Company, Georgia Utilities Company and Milledgeville Lighting Company. The new company, whose area of operations is

SOUTHEASTERN POWER & LIGHT COMPANY'S TRANSMISSION SYSTEM AND POWER STATIONS

shown in a section of the map, is controlled by Southeastern Power & Light Company.

Bonds and Notes Called in March Total $44,772,800

Electric light and power companies will call for payment during March in advance of maturity bonds and notes totaling $44,772,800. Of this amount $44,732,800 represents entire issues called, while $40,000, the remainder, consists of issues called in part. Securities of this type called in February totaled only $29,672,300 and in January $42,879,200.

Issues	Due	Amount
North American Edison, 6s, A...	1952	$13,160,000
North American Edison, 6½s, B..	1948	7,760,000
San Joaquin Lt. & Pwr., 7s, A....	1951	7,000,000
United Hudson Electric, 6s.....	1929	4,984,300
Southwestern Lt. & Pwr., coll. 6s	1937	3,100,000
Georgia Railway & Pwr , gen. 6s	1948	3,000,000
Indiana Power & Water, 6s.....	1936	1,957,000
Montpelier & Barre Lt. & Pwr. 8s	1930	500,000
Union Power, 1st 7s.....	1938	310,000
Laconia Gas & Elec., 1st 5s.....	1940	283,500
Vicksburg Lt. & Trac., 6s.....	1930	278,000
Peoples Lt. & Pwr., 5½s, conv. nts	1928	1,400,000
Peoples Lt. & Pwr., 5½s, conv.nts.	1928	1,000,000
Harwood Electric, 6s*.....	1942	30,000
Sandusky Gas & Elec., 5s*.....	1945	10,000

* Not entire issues.

Concentration Central Feature in Trade Board Report

Concentration of control in a relatively small number of groups is the central feature of the much-discussed Federal Trade Commission's report on the electric power industry, recently made public, of which the official summary was printed in full in the ELECTRICAL WORLD for Feb. 26, pages 469-470. Enlightening but certainly not astounding disclosures are made concerning the degree to which such concentration has proceeded. Other phases of the industry, such as profits and pyramiding, are introduced merely to reflect the reasons for and the nature of this concentration, which is achieved through stock ownership and interlocking directorates.

Like the public antipathy of a generation ago toward "big business," there has been criticism of this centralization of control in power. The commission's report contains little that will fan such criticism. The outstanding example of concentration has to be studied prior to 1924, at which time the company concerned, the General Electric Company, decided to "divest itself of its principal instrumentality for controlling operating electric power companies, the Electric Bond & Share Company." The latter company held stock in five large holding units which had complete control of a large number of operating companies. The holding units with the proportions of voting stock held in April, 1925, were: American Gas & Electric Company, 6.68 per cent; American Power & Light Company, 22.59 per cent; Electric Power & Light Corporation, 16.24 per cent; Lehigh Power Securities Corporation, 12.68 per cent; National Power & Light Company, 11.95 per cent. This represents only a portion of Electric Bond & Share holdings.

Reports from operating companies producing more than 95 per cent of all power generated in the United States prior to 1924 show that General Electric had 12.5 per cent of installed capacity, 11.8 per cent of electrical energy generated and 9.6 per cent of all customers. While this group exceeded all others in size, it is pointed out that two others, the North American Company and the Insull interests, followed close behind. While one incentive toward such concentration was obviously

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday March 15	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	92½	83	93
Adirondack Pwr. & Lt.—7% pf.	107½	107	109½
Adirondack Pwr. & Lt.—8% pf.	113	112	114
Ala. Pwr., 7% pf.	111	107	111½
Allis-Chalmers Mfg., 7% pf.	k110½	109	111½
Allis-Chalmers Mfg., 6% com.	95½	88	97½
Aluminum Co. of Amer., com.	71	....	....
Aluminum Co. of Amer., 6% of.	102	101½	103
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	90	86½	91½
Amer. & Foreign Pwr., com.—no par.	20½	18½	23
Amer. Bosch Magneto, com.—no par	15½	13	18½
Amer. Brown Boveri Elec†	35½	32	39½
Amer. Brown Boveri Elec., pf. $7....	k 94½	95½	98
Amer. Gas & Elec., 6% pf.—no par..	98	95½	98½
Amer. Gas & Elec., com.†—no par...	72½	68½	100½
Amer. Lt. & Trac., 6% pf.	112	112	120
Amer. Lt. & Trac., com.†	k231	222½	235
Amer. Pwr. & Lt., 6% pf.	99½	97½	100½
Amer. Pwr. & Lt., com.†—no par...	58½	54	61½
Amer. Pub. Serv., 7% pf.	k 98½	95	99½
Amer. Pub. Serv., com.†	50	....	....
Amer. Pub. Utilities, 7% pr. pf....	88	88	93
Amer. Pub. Utilities, 7% ptc. pf....	78	73	82
Amer. Pub. Utilities, com.	m66	65	70
Amer. States Sec., A.	3	3½	4½
Amer. States Sec., B.	3	3	4½
Amer. Superpwr., $6 pf.—25...	27½	26½	28½
Amer. Superpwr., 7% pf., ex. div....	94½	....	....
Amer. Superpwr., Class A†—no par..	29	27½	29½
Amer. Superpwr., Class B†—no par..	29½	28½	30
Amer. Wtr. Wks. & Elec., 7% pf....	108	105	110½
Amer. W. W. & E., com. $1.20—20..	78½	62½	78½
Anaconda Copper Cap. $3.	46½	45	49½
Appalachian Electric Pwr., 7% pf....	104	100	102
Appalachian Elec. Pwr., 2d pf., 7%..	91	100	102
Appalachian Elec. Pwr., com.	m78	....	....
Arizona Pwr., 7% pf.	76	77	84½
Arizona Pwr., com.	23	....	....
Arkansas Cent. Pwr., pf.—$7 no par.	k102	101	103
Arkansas Lt. & Pwr., 7% pf.	k102	101	104
Arkansas Lt. & Pwr., com.	101½	....	....
Assoc. Gas & Elec., $3.50—50.	51	....	....
Assoc. Gas & Elec., pf.—$6—no par.	87½	....	....
Assoc. G.&E., Class A, $2.50—no par	40½	35	41½
BABCOCK & WILCOX, 7% com..	119	....	....
Binghamton L., H. & P., $6 pf.	92	93	95
Birmingham Elec., pf.—$7—no par..	106½	105	109
Blackstone Valley G. & E., $6 pf....	102½	103	105
Blackstone Valley Gas & Elec., 10% com.—50.	109½	98	110
Blaw-Knox, com.†	f 71	70	73
Brazilian Trac., Lt. & pwr., com.†...	f128	....	....
Broad River Pwr., 7% pf.	99½	97	100
Brooklyn Edison, 8% com.	153½	148½	154½
Buffalo, Niagara & East. Pwr., pf.—25	25	....	....
Buffalo, Niagara & East. Pwr. com.† —no par	27½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	97	96	98
California Ry. & Pwr., 7% pf.	130	125	150
Carolina Pwr. & Lt., pf.—$7—no par	f106½	107	108½
Central & S.W. Util., 7% pf.—no par	a 95	93½	96½
Central & S. W. Util., pr. in. $7 pf. —no par	a100	98½	101½
Central Ariz. Lt. & Pwr., 7% pf....	95	....	....
Central Ark. Ry. & Lt., 7% pf....	101	100	102
Central Ill. Pub. Serv., 6% pf....	k 88	88	91
Central Ind. Pwr., 7% pf.	88	86	90
Central Pwr. & Lt., 7% pf.	101½	100½	103
Cleveland States Elec., 7% pf.	92	93	96
Central States Elec., com.†	m200	....	....
Century Elec., 6% com.	m115	115	115
Chicago Fuse Mfg., com.—$2.50 no par	a 32	30	34½
Cincinnati Gas & Elec., 5% com....	g 95	....	....
Cities Service, 6% pf.	l 89½	87	92½
Cities Service, pf. B—10.	l 8	7½	8
Cities Service, pf. BB—100.	l 82	81½	85½
Cities Service, com.—20.	l 52½	40½	58½
Cities Service, Bks. Shrs.—10.	m 29½	25	29½
Clarion River Pwr., 8% pf.	95	....	....
Cleveland Elec. Illg., 6% pf.	108	108	109½
Cleveland Elec. Illg., 10% com.	300	302	310
Colorado Pwr., 7% pf.	k 95	95	97½
Columbia Gas & Elec., 6% pf.	103½	99½	103½
Columbia G. & E. com. $5—no par...	85½	82½	91½
Columbia Ry., Gas & Elec., 6% pf...	94	....	....
Columbus Elec. & Pwr., 2d. pf....	103	....	....
Columbus Elec. & Pwr., 9% com.	66½	....	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	97	98½	99½
Columbus Ry., Pwr. & Lt., 6½% pf. B	98	96	99
Columbus Ry., P. & L., com.—no par	70	75	79
Commonwealth Edison, 8% com....	a142½	....	....
Commonwealth Pwr., 6% pf.	93½	91½	93½
Commonw'th Pwr., $2, com.—no par	47	42½	47½
Conn. Lt. & Pwr., 8% pf.	117	119	123
Conn. Lt. & Pwr., 7% pf.	113	112	113½
Cons. Gas of N. Y., pf.†—50.	55	55½	62½
Cons. Gas of N. Y., com $5—no par.	98	94½	109½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	m105	105	107
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	e112½	111	112½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	e114½	113½	115½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	e127	....	....
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par.	e 53	....	....
Consolidated Pwr. & Lt., 7% pf.	101	100	103
Consumers Pwr., 6% pf.	101	100	102
Consumers Pwr., 6.6% pf.	104	103	105½
Continental Gas & Elec., 7% ptc. pf.	104	103	106½
Continental Gas & Elec., 7% pr. pf...	101	100	103
Conti. G. & E. com. $4.40—no par..	k215	210	225
Crocker Wheeler, com.†	35½	....	....
Crocker Wheeler, 7% pf.	82	....	....
DALLAS PWR. & LT., 7% pf....	107	107	109½
Dayton Pwr. & Lt., 6% pf.	102	101	103
Detroit Edison, 8% com.	k138½	133½	139
Dubilier Condenser, com.—no par...	k 5	3½	5½
Dubuque Elec., 6% pf.	103	93	105
Duquesne Lt., 7% pf.	115½	114½	116½
EASTERN NEW YORK UTIL., $7 pf.	102½	102	104½
Eastern New York Util. com.	65	70	75
Eastern States Pwr., $7, com.	11	11	13
Eastern States Pwr., pf.	93	93	95
East. Tex. Elec., 7% pf.	106	106	108
East. Tex. Elec., com. $5—no par....	90	....	....
Edison Elec. of Boston, 12% com....	d231	....	....
El Paso Elec., com. $5—no par.	70	....	....
El Paso Elec., 7% pf.	106	105	106½
Elec. Bond & Share, 6% pf.	l106½	105½	109
Elec. Bd. & Sh. Sec.,†com. $1—no par	l 68	67½	72½
Electric Household Util.†.	a 13	....	....
Elec. Investors, 6% pf.—no par....	93	92	94
Elec. Investors, com.†—no par....	34½	32½	37
Elec. Investors, 10% pd. receipts.	15	....	....
Elec. Pwr. & Lt., ctfs. pf.	98	96	99½
Elec. Pwr. & Lt., ctfs., 40% pd.	106	103½	106½
Elec. Pwr. & Lt., ctfs. full pd.	k105	....	....
Elec. Pwr. & Lt., ctfs., com.—no par.	18	16½	18½
Elec. Refrig. cap.†	35½	30½	37½
Elec. Ry. Securities, com.—no par...	7	5½	7½
Elec. St. Battery com. $5.25—no par	71½	68½	79½
Elmira Wtr., Lt. & R.R., 7% pf.	100½	99	101½
Emerson Elec., pf.	m105	....	....
Empire Pwr., A $6.	33½	26	35½
Engr. Pub. Serv., $7 pf.—no par....	m 98½	93½	99½
Engr. Pub. Serv., com.—no par....	23½	21½	24½
Eureka Vacuum Cleaner, com. $4— no par.	69½	60½	69½
FAIRBANKS MORSE, 7% pf....	k108	107½	112
F.-M., com.—$2.60—no par.	k 41½	38½	42½
Federal Lt. & Trac., com.†	41	37½	44½
Federal Lt. & Trac., 6% pf.	k 93½	91½	95
Ft. Worth Pwr. & Lt., 7% pf.	l109½	108	112
GALVESTON-HOUSTON ELEC. 6% pf.	71	68	72
Galveston-Houston Elec., com.	26	28	30
Gen. Elec., 8% com.	86½	81	87½
Gen. Elec., special—10.	11½	11½	11½
Gen. Gas & Elec. (Del.) com. A. $1.50—no par	43½	40½	47½
Gen. G.&E. (Del.) com. B—no par..	m 42½	39	43½
Gen. G.&E. (Del.) pf. A. $8—no par.	k115	115	115½
Gen. G.&E. (Del.) pf. A $7—no par..	k101	100	107½
Gen G.& E. (Del.) pf. B $7.	k 98½	96	99
Gen: Pub. Serv., $7 pf.	k103	102	108
Gen. Pub. Serv., com.	12½	11½	14½
Ga. Lt., Pwr. & Rys., 6% pf.	85	87	92
Ga. Lt., Pwr., & Rys., com.	m 60	....	....
Ga. Ry. & Pwr., 8% pf.	k122	119	123
Ga. Ry. & Pwr., 7% pf.	108½	106	108½
Ga. Ry. & Pwr., 4% pf.	m119	....	....
Ga. Ry. & Pwr., 4% com.	122	....	....
Gt. Western Pwr., 7% pf.	h102½	....	....
IDAHO PWR., 7% pf.	103	103	105
Ill. No. Utilities, 6% pf.	k 88	88	92
Ill. Pwr. & Lt., 7% pf.	99½	99	101
Ingersoll Rand com. $8.	k 92½	92	93½
Int. Combus. Engr., com. $2—no par	57½	43½	64
Int. Util., Class A—$3.50—no par..	35	28	35½
Int. Utilities, Class B—no par.	4½	3	5½
Interstate Pwr., pf.—$7—no par....	93	93	97
Interstate Pub. Serv., 7% pf.	99½	98	99½
Iowa Ry. & Lt., 7% pf.	97½	97	99
JERSEY CENTRAL PWR. & LT., 7% pf.	97½	97½	98½
Jersey Cent. Pwr. & Lt., 7% pfc. pf..	113	111	115
Jersey Cen. Pwr. & Lt., com.—no par	k 25	....	....
Johns-Manville, com.†—no par.	72½	55½	73½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, March 12. lBid price Wednesday, March 16. mLatest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday March 15	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	113¼	112	114¼
Kansas Gas & Elec., 7% pf. ex. div.	‖103¼	103	104
Kentucky Hydro-Elec., 7% pf.	a 95½	94½	97½
Kentucky Sec.,6% pf.	82	83	87
Kentucky Sec., 5% com.	107	110	115
Kentucky Utilities, 6% pf.	95½	95	96½
Keystone Pwr. & Lt., 7% pf.	96½	96	98½
LACLEDE GAS LT., 8% com.	185¼	173¼	189½
Lehigh Pwr. Sec., com.—no par.	18¼	15¼	18¼
Long Island Ltg., 7% pf.	107	107	109
Long Island Ltg., com. $2—no par.	k140	139	153
Los Angeles Gas & Elec., 6% pf.	99	98	100½
Louisville Gas & Elec., cl. A. $1.75	25½	23¼	26½
MAN. ELEC. SUPPLY, cap. $4.25—no par	71	53¼	72
Manila Elec., com.†—no par	k 45	40	46
Maytag Mfg., com. .50—no par	26½	23¼	28
Memphis P. & L., pf.—$7—no par	108	107	109
Metropolitan Ed., pf.—$6—no par.	96	93	97
Metropolitan Ed., pf.—$7—no par.	105	104	108
Metropolitan Ed., com. $5—no par.	60	....	....
Middle West Utilities, 7% pf.	a108¼	....	....
Middle West Util., 7% pr. lien pf.	a118	....	....
Middle West Util., com. $6—no par	a109¼	....	....
Midland Utilities, pr. ln. 7% pf.	a102	....	....
Midland Utilities, 7% pf. A.	a 98½	....	....
Milwaukee Elec. Ry. & Lt., 7% pf.	k100	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	k 98½	98	101
Minn. Pwr. & Lt., 7% pf.	‖104½	104	105
Miss. Pwr. & Lt., $8 pf.	109	106	111
Miss. River Pwr., 6% pf.	97½	94	97
Miss. River Pwr., com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	102½	101½	105
Mohawk Hudson Pwr., 2d pf.—$7—no par	100	98	101½
Mohawk Hudson Pwr., com.—no par	24½	20½	27
Montana Pwr., 7% pf.	m119½	118½	119½
Montana Pwr., 4% com.	87½	81½	89½
Montreal Pwr., 7½% com.	f 76½	....	....
Mountain States Pwr., 7% pf.	99	97	101
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	105	98	105
National Carbon, 8% pf.	a132	130½	132
National Elec. Pwr., A†	24	23½	25½
National Elec. Pwr., 7% pf.	a 96½	93½	96½
National Lt., Ht. & Pwr., com.	24	....	....
National, Light, Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf.—$7—no par	105	101½	106½
National Pwr. & Lt., com.†—no par.	21½	19½	22
National Pub. Serv., 7% pf.	94½	93	96
National Pub. Serv., 7% ptc., pf.	113	108	115
National Pub. Serv., A com. $1.60—no par	21½	18½	21½
National Pub. Serv., B com.—no par	17½	14	18½
Nebraska Pwr., 7% pf.	‖107½	106	108½
Nevada-Calif. Elec., com.	m 25	25	26½
New Brunswick Pwr., 7% pf.	55	....	....
New Eng. Pub. Serv., pr. ln. pf. $7..	99½	98½	101
New Eng. Pub. Serv., pf. $7.	95½	95	97
N. J. Pwr. & Lt., 6% pf.	93	....	....
New Orleans Pub. Serv.—7% pf.	104	103	105
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	....	....
N. Y. Central Elec., 7% pf.	102	102	104
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., 7% pf.	109	....	....
Niagara Falls Pwr., 7% pf.—25.	k 28½	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	111	110½	113
No. Amer., 6% pf.—50.	51½	50	51½
No. Amer., com.—10.	48½	45½	50½
No. Amer. Edison, $6 pf.—no par.	99½	96½	100½
No. Amer. Lt. & Pwr., 7% pf.	101	100	104
No. Caro. Pub. Serv., pf.—$7—no par	94	93	97
Northeastern Pwr., com.	16½	16½	18½
No. Indiana Gas & Elec., 7% pf. A.	102	102	104
No. N. Y. Utilities, 7% pf.	104	103	105½
No. Ohio Pwr., com.—no par.	11½	9½	13½
No. Ohio Trac. & Lt., 6% pf.	80	78	81
No. Ohio Trac. & Lt., 7% pf.	90	90	93
No. Ont. Lt. & Pwr., 6% pf.	88½	84	90
No. Ont. Lt. & Pwr., 4% com.	74	73	78
No. States Pwr., (Wis.) 7% pf.	95	....	....
No. States Pwr., (Del.) 8% com.	112½	109½	113½
No. Texas Elec., 6% pf.	68	65	70
No. Texas Elec., 4% com.	39	27	36
OHIO BRASS, com. B $4—no par.	83	74	85
Ohio Brass, 6% pf.	100	100	103
Ohio Gas & Elec., 7% pf.	100	95	97
Ohio Pwr., 6% pf.	98	96	99
Ohio Pub. Serv., 6% pf.	k 94	95	96½
Ohio Pub. Serv., 7% pf.	k104	103	105½
Ohio River Edison, 7% pf.	104	103	105½
Oklahoma Gas & Elec., pf.	98	....	....
PACIFIC GAS & ELEC., 6% pf.	k 25	24½	26½
Pacific Gas & Elec., 8% new com.	32½	31	33
Pacific Pwr. & Lt., 7% pf.	‖103	102	104
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 73	71½	73½
Penn-Ohio Edison, 7% pf.	100	98	100
Penn-Ohio Elec., 7% pf.	98½	95	96
Penn-Ohio Pwr. & Lt., 7% pf.	101	99	102
Penn-Ohio Pwr. & Lt., 8% pf.	110	109	112
Penn Pwr.& Lt.—$7—no parex.div.	‖107	107	108½
Penn. Pub. Serv.,6% pf.	90	....	....
Penn Wtr. & Pwr., 8% com.	a176	176	185
Phila. Co., 6% pf.—50.	k 51	50	53
Phila. Co., com.—50.	91½	85½	92½
Phila. Elec., 8% com.—25.	c 47½	....	....
Portland Elec. Pwr., 7% pf.	98	97½	100
Portland Elec. Pwr., 6% pf.	79	81	83
Portland Elec. Pwr., 6% 2d pf.	60	68	70
Portland Elec. Pwr., com.	20	28	30
Potomac Elec. Pwr., pf.	‖108½	....	....
Pwr. Corp. of N. Y., com. $1—no par	m 79	....	....
Pwr. Sec., pf.—no par.	k 27	28	33
Pwr. Sec., com.—no par.	k 4	5	8
Public Serv. of Colorado, 7% pf.	m 97	....	....
Pub. Serv. of N. J., 7% pf.	111½	108½	111½
Pub. Serv. of N. J., 6% pf.	100½	98½	101
P. S. of N. J., $5 com.—no par.	34½	32	35½
Pub. Serv. of No. Ill., 6% pf.	a103	102	105
Pub. Serv. of No. Ill., 7% pf.	a114	113½	116
P. S. of No. Ill., com. $8—no par.	a133½	130½	136
Pub. Serv. of No. Ill., 8% com.	k130½	130	135
Pub. Serv. of Okla., 7% pf.	99	99	100½
Pub. Serv. Elec. & Gas, 6% pf.	105	102	105½
Pub. Serv. Elec. Pwr., 7% pf.	k115½	113½	115½
Puget Sound Pwr. & Lt., 7% pf.	107	....	....
Puget Sound Pwr. & Lt., 6% pf.	85	83½	85
Puget Sound Pwr. & Lt., com.	28½	29½	33½
RADIO CORP. OF AMER., pf.—50.	52½	50½	53
Radio Corp. of Amer., com.—no par.	54½	47½	56½
Republic Ry. & Lt., pf.	k120	....	....
Republic Ry. & Lt., com.	122	112	135
Rochester Gas & Elec., 6% pf. D.	103	101	103½
Rochester Gas & Elec. 7% pf. B.	103	101½	103½
Rochester Gas & Elec., 7% pf. C.	106	....	....
SAFETY CABLE, com. $4.	63	52½	64½
San Joaquin Lt. & Pwr., 7% pf.	106½	105	108
St. Joseph Ry., L., H. & P., 5% pf.	70	70	73
Servel Corp.	9½	7½	10½
Sierra Pacific Elec., com.	26½	26½	27½
Sioux City Gas & Elec., 7% pf.	101	99	101½
Southeastern Pwr. & Lt., pf.—$7 no par, ex div.	103	....	....
Southeastern Pwr. & Lt., com.—no par.	71½	....	....
So. Calif. Edison, 8% pf.	32	29½	32½
So. Calif. Edison, 7% pf.	36½	36½	38
So. Calif. Edison, 6% pf.	27	27½	28½
So. Calif. Edison, 5% com.	24	24½	25½
Southern Cities Utilities, 7% pf.	34½	31½	34½
Southern Cities Utilities, com. $4.	88	82½	88
Southwestern Lt. & Pwr., A $3.	40	22½	42½
Southwestern Lt. & Pwr., B.	63	60	65
Southwestern Lt. & Pwr., $6 pf.	63	60	65
Southwestern Pwr. & Lt., 7% pf.	85	83	86
Springfield (Mo.) Ry. & Lt., 7% pf.	k105	103	105½
Standard Gas & Elec., 8% pf.	97	95	100
Standard Gas & Elec., 7% pf.	58½	57½	60
Standard G. & E., com. $3—no par.	106	103	106½
Standard Pwr. & Lt., 7% pf.	57½	54	58
Staten Island Edison, pf.—$6—no par.	98½	98	100
Superheater, $6 com.—no par.	k100	99	101
Syracuse Lighting, 7% pf.	178	....	....
Syracuse Lighting, 8% pf.	102	103	107
Syracuse Lighting, 8% com.	115	....	....
TAMPA ELEC., com. $2.	300	....	....
Tenn. Elec. Pwr., 6% pf.	59	....	....
Tenn. Elec. Pwr., 7% pf.	91	92	94½
Terre Haute, Ind. & East. Trac., 5% pf.	105	103	106½
Terre Haute, Ind. & East. Trac., com	20	20	25
Tex. Pwr. & Lt., 7% pf.	1	1	3
Tide Water Pwr., 8% pf.	‖108	106	108
Timken Roller Bear., com.—$4 no par.	105	105	108
Toledo Edison, 8% pf.	87½	78	95½
Toledo Edison, 7% pf.	k116½	115	118
Toledo Edison, 6% pf.	‖107	105	108½
Toledo Edison, 6% com.	j 95	95½	97
Tri-City Ry. & Lt., 6% pf.	k100	....	....
UNITED GAS & ELEC., 6% pf.	97	90	97
United Gas & Elec., com.—no par.	99½	98	99½
United Gas & Elec. (N. J.) 5% pf.	m 57	....	....
United Gas Impr., 8% com.—50.	72	70	73
United Lt. & Pwr., pf.—$4—no par.	c 92½	....	....
United Lt. & Pwr., pf.—$6.50—no par.	50½	49¼	53½
United L. & P., com. A .48—no par.	91½	87	93½
United L. & P., com. B .48—no par.	13	12½	15½
Utah Pwr. & Lt., 7% pf.	k 16	16	18
Utica Gas & Elec., 7% pf.	‖105	104	105
Utica Gas & Elec., 8% com.	k105	105	106½
Utilities Pwr. & Lt., 7% pf.	200	....	....
Utilities Pwr. & Lt., com. A $2.	92	93	98
Utilities Pwr. & Lt., com. B $1—no par.	28½	27	30½
VERMONT HYDRO-ELEC., 7% pf.	k 14	13½	15½
Virginia Elec. & Pwr., 7% pf.	96½	95	97½
Virginian Pwr., 7% pf.	105½	105	107
Virginian Pwr., com.	108	....	....
WAGNER ELEC., 7% pf.	70	....	....
Wagner Elec., com.†—no par.	b 71½	68	74
Washington Ry. & Elec., 5% com.	b 20½	18½	24
Washington Ry. & Elec., 5% pf.	j212	....	....
Washington Wtr. Pwr., 8% com.	j 91½	....	....
West Mo. Pwr., 7% pf.	138	136	140
West Penn Elec., 7% pf.	m92	....	....
West Penn Elec., Cl. A $7.	106½	102	107½
West Penn Pwr., 7% pf.	101½	97½	103
West Penn Pwr., 6% pf.	113½	111	114
West Virginia Lt., Ht. & Pwr., 7% pf.	103½	100½	105
West Va. Utilities, 7% pf.—50.	95	94	96
Western Pwr., 7% pf.	50	48	51½
Western States Gas & Elec., 7% pf.	100	98	101½
Western States Gas & Elec., com.	96	96	98
Westinghouse Elec. & Mfg., 8% com.—50.	18	....	....
Weston Elec. Instrument, Cl. A $2.01—no par.	73½	67½	75½
Weston Elec. Instrument, com.—no par.	33½	30½	34½
Wheeling Elec., 6% pf.	k 17½	15	18½
Wis., Pwr., Lt. & Ht., 7% pf.	98	95	97
Worthington Pump, 7% pf. A.	k 95	95	97
Worthington Pump, 6% B.	k 48	46	54½
Worthington Pump, com.	k 41½	40	45
YALE & TOWNE com. $5—25.	27	20½	31½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, March 12. ‖Bid price Wednesday, March 16. mLatest quotations available. †Dividend rate variable.

the large profits possible, it is freely admitted that the increase in efficiency through interconnection has also been an incentive and has produced vast economies.

The investigation made into the influence of interlocking directorates is largely negative in result. It was found that interlocking directorates were an essential feature in the control and management exercised and there was no attempt to conceal their existence. Where directorates overlapped, as, for example, between General Electric and other important companies, there was no indication of a connection involving definite affiliation of interests between the companies concerned.

A study is made also of annual earnings in the industry as a whole. The average rate of return on total net investment for all companies reporting was 7.94 per cent. Income tax statistics for the period 1918-24 were analyzed and showed marked increases both in the number of corporations reporting and in total taxable income. The percentage of corporations reporting deficits was large. The investigation showed that the electric power industry has been relatively more profitable than business generally. "The earnings thus falling to the holding companies yield approximately the same rates on total holding company investment that they yield on the common stock equities of the subsidiaries; namely, 12 to 15 per cent." The report points out that by financing the holding companies heavily with bonds and preferred stocks at lower rates, the holding-company common stock equities, ownership of which is retained by the promoters, are made to earn much higher rates. Holding company earnings on common stock equities in 1924-25 are stated to have ranged from 19 to 55 per cent in 1924 and from 21 to 40 per cent in 1925, after paying bond interest and preferred dividends.

Applications of Metropolitan Utilities Approved

Applications of the Consolidated Gas Company, New York Edison Company and other metropolitan public utilities for increases in their authorized capitalization have been granted by the Public Service Commission.

The Consolidated Gas Company of New York is authorized to issue 720,000 shares of common stock without par value. It will be sold at not less than $75 a share. It is also authorized to issue 1,200,000 shares of cumulative preferred stock without par value, to be sold at $91 or more a share.

The New York Edison Company will issue 1,800,000 shares of common stock of no par value, to be sold at not less than $50 a share.

Other authorizations for capital changes made by the commission included the following:

United Electric Light & Power Com-

pany, 260,000 shares of common stock without par value, to be sold at not less than $50 a share.

Astoria Light, Heat & Power Company, 40,000 shares of common stock without par value, to be sold at not less than $50 a share.

Westchester Lighting Company, 190,600 shares of common stock without par value, to be sold at not less than $50 a share.

New York & Queens Electric Light & Power Company, $10,000,000 face amount of 6 per cent ten-year debentures, to be sold at not less than face value.

Staten Island Edison Control Passes to New Hands.—The New York State Gas & Electric Corporation has been authorized by the Public Service Commission to acquire all the capital stock of the Staten Island Edison Corporation. The opinion of William A. Prendergast, chairman of the commission, was that the companies are controlled by the same interests, the Associated Gas & Electric Company owning 100 per cent of the stock of the New York State Gas & Electric Corporation.

Southeastern Power Votes Dividend on Common.—The first quarterly dividend of 25 cents a share on the common stock has been declared by the Southeastern Power & Light Company, payable April 20 to stockholders of record March 31. Up to the present time no dividend had been paid on the common stock because the directors felt, notwithstanding the good earnings of the company, that all surplus funds should be plowed back into the property during the period of major expansion.

Commonwealth Edison's 12 per Cent Gain

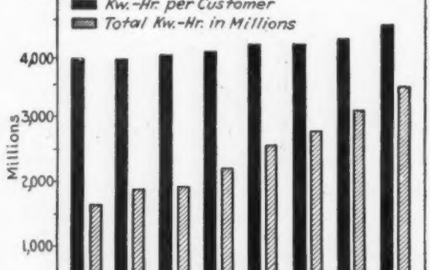
Net Operating Revenues Increased 15 per Cent and Net Income 14 per Cent—Taxes Up 20 per Cent

ALTHOUGH operating expenses of the Commonwealth Edison Company rose 10 per cent in 1926 and taxes showed a 20 per cent jump, net operating revenues for the year were 15 per cent greater than in 1925. The company turned out 12.7 per cent more power than in 1925, including energy purchased and resold. The load factor was 47.9 per cent—the highest in the company's history.

Analysis of the company's position shows interest earned two and two-fifths times. Operating expenses were 60 per cent of gross and net revenue 40 per cent. Earnings have shown a steady and rapid growth. The per capita sale of electricity was 1,029 kw.-hr. in 1926 against 936 kw.-hr. the year before. It is maintained that Chicago leads the large cities of the world in central-station sale of electricity per unit of population.

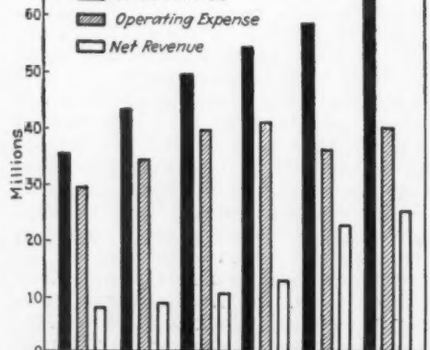
The business for the year 1926 shows an increase of more than $7,000,000 in the operating revenue—from $58,691,583 in 1925 to $65,776,058 in 1926. Operating expenses, amounting to $40,064,872 as compared with $36,262,409 in 1925, left net operating revenues totaling $25,711,185 against $22,429,175 in 1925. The report for 1926 shows that after the payment of dividends the amount carried to surplus was $4,507,750, compared with $3,563,844 during the previous year. On Dec. 31, 1926, the number of customers was 864,488, compared with 811,366 at the close of the year before, an increase of 6.5 per cent.

The Commonwealth Edison Company has made a remarkable record in operation from the viewpoint of fuel economy. In 1926 the total amount of coal burned by the company to produce electricity was 3,368,750 tons, compared with 3,062,856 tons in 1925, an increase of 10 per cent. The ratio of coal consumed to kilowatt-hours produced showed a further reduction in the year 1926. If the company's 1916 ratio of coal consumed to kilowatt-hours produced were applied to the 1926 production of electricity, the company's coal consumption for 1926 would have been increased by 1,200,000 tons and its operating expenses by $4,540,000.



VOLUME OF BUSINESS SHOWS STEADY INCREASE

The capital structure of the company at the close of the year included capital stock outstanding to the amount of $110,483,400 and funded debt totaling $104,774,000, the latter consisting of first mortgage gold bonds bearing interest at the rate of from 4½ to 6 per cent.



REVENUES HAVE INCREASED MORE RAPIDLY THAN EXPENSES

Wired Homes in Foreign Countries

The following table, recently published by the Department of Commerce, is the result of an attempt to gather information on the percentage of wired homes in various foreign countries. Though recognized as incomplete and doubtless containing inaccuracies, it is presented as the latest available compilation. It is to be reprinted periodically, and an effort will be made to correct errors and include further areas. The discrepancies between these figures and others published in the past, likewise embodying the results of conscientious efforts to gather accurate data, are evidence of the difficulties encountered. They bring out the fact that accurate information is, for many of the countries listed, simply not available.

ELECTRICAL DEVELOPMENT IN FOREIGN COUNTRIES

All figures represent thousands (000 omitted)

Country	Population	Total No. of Houses	Domestic Lighting Consumers	Power and Commercial Lighting Consumers	Percentage of Homes Wired
Europe:					
Belgium	7,466	1,600	492	...	30.7
Czechoslovakia	13,611	3,500	1,000	300	20.0
Denmark	3,268	750	620	80	72.0
Estonia	1,107	252	97	...	38.5
Finland	3,367	700	120	...	17.2
France	39,210	9,345	2,000	...	21.4
Germany	59,853	14,700	3,000	...	20.4
Greece	5,168	1,200	12	...	1.0
Italy	38,901	.....	1,500	...	....
Latvia	1,503	293	100	...	34.2
Lithuania	2,293	269	25	...	9.3
Netherlands	6,865	800	400	...	50.0
Norway	2,632	.....	300	...	....
Poland	27,558	3,293	400	...	12.1
Portugal	6,033	.....	100	...	....
Spain	21,347	3,650	1,000	...	27.4
Sweden	5,904	.....	500	11	....
Switzerland	3,880	415	400	...	96.5
Turkey	.....	.....	30	...	....
United Kingdom	44,169	8,500	1,500	250	17.7
North and Central America:					
Canada	8,788	1,873	1,200	36	62.3
Guatemala	2,454	32	10	1	27.1
Salvador	1,551	.....	10	...	....
Mexico	15,501	2,500	350	100	10.0
Cuba	3,123	.....	150	34	....
Dominican Republic	897	167	6	...	3.6
Haiti	2,045	.....	3	...	....
South America:					
Argentina	8,699	1,200	450	130	26.7
Colombia	5,855	900	50	3	5.2
Ecuador	2,000	280	44	1	15.3
Guianas	450	.....	6	...	....
Paraguay	1,000	88	4	...	4.6
Uruguay	1,529	320	110	25	26.5
Venezuela	3,027	.....	15	...	....
Other countries	.....	.....	750	...	....
Asia:					
British India	247,003	1,500	234	9	15.0
Japan	59,936	10,856	8,140	189	73.4
Persia	.....	1,600	2	...	.1
Oceania:					
Australia	5,992	1,107	453	...	41.0
New Zealand	1,347	260	153	...	59.0
Africa:					
British South Africa	6,929	208	115	20	45.6
Egypt	13,551	300	55	1	18.8
Rhodesia	.....	10	3	1	53.3
World total estimate	1,837,000	.....	45,000	...	...

Manufacturing and Markets

Industrial Plant Buying

Specifications for Each Product Are Basis of Free Competition—Reciprocal Buying a Factor

AN APPROVED list of manufacturers of every product purchased is filed in card-index form by a large industrial firm and is used as the basis of all its buying. The purchasing agent of this company, when interviewed by a representative of the ELECTRICAL WORLD, stated that this approved list has been built up on the basis of, first, quality; second, service, and third, price. Quality was placed first because the goods were a part of the final product, and service was placed before price because there was no use in buying an article needed for the production of other goods if it was not possible to get a satisfactory delivery of the goods. The matter of service is particularly important, and where good service is rendered it is reflected to the manufacturer's benefit, especially in the case of a special order. When such a special order is received, the purchasing agent as soon as he receives the requisitions begins to look around for the necessary material, and he loses no time in dickering over a small price differential where a grade A rating has been applied to the seller.

Specifications covering every product purchased by the company form the basis of competition, and such specifications have been found to be of distinct value in raising the standard of the various products. If a specification needs to be written around an article, it is done by co-operative development. A specification is first drawn up by the engineering department, and this is used only as a preliminary specification, which is sent to various manufacturers of the particular product. Criticisms and suggestions are requested so as to obtain a better specification that will permit of free competition. Using the preliminary specifications and the various suggestions received, the final specifications are drafted.

This company states that this method often results in more rigid tests being called for in the specifications than was originally planned in order to keep the material desired up to the proper standard.

Periodical testing and continuous inspection of all incoming material assure the receipt of a product that meets the specifications. No unnecessary requirements and none difficult of interpretation or proof are written into the specifications. For instance, if the company desires a high grade of rubber-insulated wire, while recognizing that a 30 per cent Para rubber compound would fill that classification, rather than call for a 30 per cent compound the specification outlines a test requirement rigid enough to determine the quality of the rubber content.

When a manufacturer is not already selling to the company, as a general rule the first requisite is to show ability to meet price competition. If this is done, samples are submitted by the manufacturer, and a trial order results if the tests are satisfactory. If the service rendered is good, then this manufacturer will have his name placed on the approved list.

This company has learned through its experience that co-operative development is especially valuable for many products used in its industry and believes that the better acquainted the seller is with the use to which his material is to be put the better it is for both parties. In many products the purchasing agent said it was difficult to make a choice because quality, service and price were so nearly on a par. In such cases the matter resolves itself into reciprocal buying, and this is playing a large part in determining the placing of an order.

Electrical Exports Show Gain During 1926

Exports of electrical equipment from the United States during 1926 were valued at approximately $97,000,000, which represents an increase of about $8,000,000 over 1925 exports and $15,000,000 over those of 1924, according to preliminary figures announced by the electrical equipment division of the Department of Commerce. The 1925 average monthly increase amounted to about $676,900 over 1925 and $1,259,000 over 1924. Out of a total of 67 classifications of exports, 44 showed an increase.

Outstanding increases were recorded during the past year in shipments of steam turbo-generator sets, which totaled $1,412,088 as compared with $795,622 in 1925; flashlight batteries, which were valued at $1,674,309 as

Value of Electrical Exports for January, 1927, Compared with Corresponding Month in 1926

(Issued by Bureau of Foreign and Domestic Commerce)

Articles	January 1926	January 1927
Generators:		
Direct-current:		
Under 500 kw	$67,312	$106,999
500 kw. and over	16,292	54,700
Alternating-current:		
Under 2,000 kva	23,956	13,135
2,000 kva. and over	73,087	77,018
Steam turbo-generator sets	74,332	52,411
Accessories and parts for generators	41,201	100,243
Self-contained lighting outfits	85,747	64,282
Batteries:		
Flashlight batteries	103,286	157,815
Other primary batteries	114,251	156,162
Storage batteries	226,363	346,520
Transforming or converting apparatus:		
Power transformers	183,624	132,905
Other transformers	89,700	78,983
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	119,930	130,679
Transmission and distribution apparatus:		
Switchboard panels, except telephone	511,687	84,643
Switches and circuit breakers over 10 amp	242,859	173,653
Fuses and fuse blocks	27,579	34,188
Watt-hour and other measuring meters	26,647	42,574
Volt, watt and ampere meters and other recording, indicating and testing apparatus	196,333	161,234
Lightning arresters, choke coils, reactors and other protective devices	43,161	68,111
Motors, starters and controllers		
Motors under 1 hp	183,185	168,223
Stationary motors:		
1 to 200 hp	209,052	207,208
Over 200 hp	146,455	14,629
Railway motors	56,522	105,192
Electric locomotives:		
Railway	61,700	
Mining and industrial	24,148	13,844
Starting and controlling equipment:		
For industrial motors	85,736	87,158
For electric railway and vehicle motors	12,508	32,708
Portable electric tools	21,518	80,173
Accessories and parts for motors	214,593	164,457
Electric appliances:		
Electric fans	67,755	88,700
Electric lamps:		
Metal filament	117,297	183,296
Other electric lamps	18,570	32,641
Flashlights	136,077	162,068
Searchlights and projectors	49,656	130,841
Motor-driven household devices	$125,685	$165,518
Domestic heating and cooking devices	143,122	107,548
Industrial electric furnaces and ovens	12,679	18,782
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc	110,780	156,598
Signal and communication devices:		
Radio apparatus:		
Transmitting sets and parts	16,601	11,311
Receiving sets	139,856	202,075
Tubes	46,616	55,102
Receiving set components	125,227	177,465
Receiving set accessories	171,359	165,687
Telegraph apparatus	49,726	149,106
Telephone apparatus:		
Telephone instruments	23,732	36,263
Telephone switchboards	7,102	4,451
Other telephone equipment	199,141	231,940
Railway signals, switches, and attachments	38,325	33,871
Bells, buzzers, annunciators and alarms	18,442	20,233
Other electric apparatus:		
Spark plugs, magnetos and other ignition apparatus	149,702	211,115
Insulating material	122,053	129,049
Metal conduit, outlet and switchboxes	67,245	54,390
Sockets, receptacles and lighting switches	137,062	164,927
Electric lighting fixtures, interior and street	131,846	159,956
Other wiring supplies and line material	93,724	104,825
Other electrical apparatus not elsewhere stated	642,803	729,211
Rubber and friction tape	15,704	32,372
Globes and shades for lighting fixtures	47,869	52,005
Electrical glassware except for lighting	35,615	24,212
Electrical porcelain:		
For less than 6,600 volts	50,079	54,958
For 6,600 volts and over	62,137	50,472
Carbons, carbon brushes and electrodes:		
Electrodes for electric furnaces	171,517	176,484
Other carbon products	57,314	179,221
Insulated wire and cable (iron and steel)	29,679	19,420
Copper, bare wire	116,984	160,524
Copper insulated wire and cable	314,432	365,301
Total	$7,146,977	$7,711,883

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	January 1926	January 1927	Per Cent Increase or Decrease	Twelve Months 1925–6	Twelve Months 1926–7	Per Cent Increase or Decrease
New York	291	372	+27.8	4,062	4,238	+ 4.33
Middle and Southern Atlantic	161	137	—14.9	2,679	2,178	—18.7
New England	104	112	+ 7.69	1,024	1,508	+47.5
Pacific Coast	30	9	—70.0	249	249	.....
Central	753	767	+ 1.86	10,510	10,126	— 3.65
Total	1,339	1,397	+ 4.33	18,524	18,299	— 1.21

TOTAL AMOUNTS REPORTED

Division	January 1926	January 1927	Per Cent Increase or Decrease	Twelve Months 1925–6	Twelve Months 1926–7	Per Cent Increase or Decrease
New York	$37,435	$62,293	+86.4	$576,211	$639,987	+11.1
Middle and Southern Atlantic States	15,639	14,289	— 8.74	307,865	269,412	—12.5
New England	9,614	10,608	+10.3	107,313	108,887	+ 1.28
Pacific Coast	4,764	1,154	—75.8	33,780	34,623	+ 2.50
Central	91,566	91,704	+ .15	1,297,534	1,223,496	— 5.71
Total	$159,038	$180,048	+13.2	$2,382,903	$2,276,407	— 2

AVERAGE AMOUNTS

Division	January 1926	January 1927	Twelve Months 1925–6	Twelve Months 1926–7
New York	$129	$167	$142	$151
Middle and Southern Atlantic States	97	104	113	124
New England	92	94	105	72
Pacific Coast	159	128	136	139
Central	122	120	123	121

against $1,213,766 in the year before; other primary batteries, which amounted to $2,020,298 as compared with $1,202,652 in 1925; storage batteries, which increased to $3,443,121 from the 1925 total of $2,682,602; railway locomotives, which totaled $1,841,586 as against $481,666 in 1925; metal-filament electric lamps, which rose to $1,603,230 from the 1925 figure of $1,250,357; flashlamps, which amounted to $2,057,673 as compared with $1,342,225 in the preceding year, and street and interior electric lighting fixtures, which increased in 1926 to $1,860,225 from $1,313,868 in 1925.

Exports of rectifiers, double-current and motor-generators, dynamotors and synchronous and other converters amounted to $1,556,654 during the year under survey as compared with $967,165 in the preceding year. Shipments of voltmeters, wattmeters and ammeters and other indicating, testing and recording apparatus were valued at $2,152,257, as against $1,695,906 in 1925. Exports of stationary motors of 1 hp. to 200 hp. amounted to $3,207,141 in 1926 as compared with $2,472,418 in the preceding year. Shipments of railway motors increased to $1,126,836 from the 1925 total of $807,537.

Exports of motor-driven household devices amounted to $1,743,677 in the year under survey, as compared with $1,205,515 in 1925. Shipments of domestic heating and cooking devices totaled $1,722,381, as against the total of $1,339,894 exported in the year before. Shipments of radio equipment decreased about $1,209,000 in value during the past year. Exports of this equipment have risen rapidly recently, but keener foreign competition has caused this reduction in the volume of American radio sales abroad.

Committee on Carbon-Brush Simplification Appointed

The first of a series of conferences held to study the working out of the present program covering the simplification of carbon brushes and brush shunts was held recently by the committee appointed by the Department of Commerce. The committee will consider the further simplification of carbon brushes and brush shunts and will recommend any revisions it finds necessary on Nov. 1, 1927, the end of the first year of the present program. That program appeared in the April 3 issue of the ELECTRICAL WORLD (page 738).

The committee appointed by the Department of Commerce consists of E. A. Williford, chairman, National Carbon Company, Cleveland, and J. Belmont Mosser, Speer Carbon Company, St. Mary's, Pa., representing the manufacturers; L. F. Adams, General Electric Company, Schenectady, and E. R. Harris, Westinghouse Electric & Manufacturing Company, East Pittsburgh, representing the motor and generator manufacturers; John R. Whitehead, Fairbanks-Morse Company, Chicago, representative of the National Association of Purchasing Agents, Inc., New York, and F. H. Prescott, General Motors Corporation (Delco-Remy Division), Anderson, Ind., representing the distributors, and Alexander Maxwell, National Electric Light Association, New York, and A. C. Cummins, Carnegie Steel Company, Duquesne, Pa., representative of the Association of Iron and Steel Electrical Engineers, representing the users.

Proposed Work in February Gains, but Contracts Drop

Large Decrease in New York City During 1926 Did Not Affect United States as a Whole

AWARDING of contracts for heavy engineering construction in the United States during February showed a drop of 3 per cent compared with the same month last year. This is offset, however, by an increase of 33 per cent in work proposed during the last month compared with February, 1926. Despite the slight decline in money value of contracts let in February from the total of the month preceding, as shown in the accompanying table, marked activity in both proposed work and awards is noted in waterworks, sewers, bridges and various unclassified jobs. Contracts show gains in commercial buildings and excavating projects, while proposed work reflects an upward turn in volume of industrial and public buildings.

Twenty-two states registered higher contract totals last month than for the first month of the new year. These were Maine, Vermont, Rhode Island, New Jersey, West Virginia, Georgia, Florida, Alabama, Mississippi, Tennessee, Indiana, Wisconsin, Missouri, Arkansas, North Dakota, Nebraska, Oklahoma, Texas, Colorado, Idaho, Nevada and Washington. In arriving at the totals shown in the table the following minimum was adopted in each case: Waterworks and excavations, drainage, irrigation, harbor work, etc., $15,000; other public works, $25,000; industrial buildings, $40,000; com-

Value of Contracts Let in the United States and Canada During February, 1927

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U.S.	Canada
Waterworks	$39,000	$254,000	$84,000	$2,522,000	$326,000	$952,000	$4,677,000	$7,357,000	$50,000
Sewers	40,000	1,050,000	332,000	3,019,000	401,000	1,511,000	6,353,000	11,050,000	620,000
Bridges	27,000	3,203,000	433,000	.....	648,000	1,254,000	5,625,000	9,786,000	.....
Excavation, drainage, irrigation	.....	28,000	87,000	85,000	533,000	155,000	944,000	1,547,000	.....
Streets and roads	93,000	2,943,000	2,942,000	643,000	2,550,000	3,199,000	12,335,000	36,618,000	60,000
Industrial building	1,105,000	1,313,000	980,000	2,535,000	2,272,000	1,343,000	9,553,000	31,131,000	.....
Commercial building	7,500,000	30,714,000	11,693,000	35,000,000	18,928,000	16,535,000	120,420,000	231,705,000	2,575,000
Federal government	.....	1,501,000	55,000	23,000	124,000	40,000	1,752,000	5,577,000	.....
Unclassified	1,133,000	1,428,000	4,347,000	2,000,000	3,776,000	877,000	13,461,000	22,239,000	280,000
February, 1927	$9,937,000	$42,439,000	$21,008,000	$45,832,000	$30,123,000	$25,931,000	$175,270,000	$357,010,000	$3,504,000
January, 1927	18,525,000	51,381,000	12,716,000	40,104,000	24,441,000	34,573,000	181,740,000	.....	5,028,000
January 1 to date, 1927	28,462,000	93,820,000	33,724,000	86,936,000	54,564,000	60,504,500	357,010,000	.....	8,632,000
January 1 to date, 1926	16,829,000	134,414,000	57,308,000	78,359,000	46,074,000	37,695,000	370,679,000	.....	12,135,000

mercial, educational, religious and other buildings, $150,000.

The construction volume index number for February was 182, and it was 228 for the whole of 1926, as compared with 100 for 1913. This means that the actual volume of contract letting in 1926 (not the mere money value of the contracts let that year) was 128 per cen' above the volume for 1913. The construction volume index number for February, 1926, was 187.

Analysis of New York City's construction program during the past three years shows that recent warnings against overbuilding were prompted by the tremendous program of 1925 rather than by current contract letting.

The slowing up of construction volume, as measured by the aggregate of commercial building contracts awarded of $150,000 or more, is evidenced by a drop of 30 per cent from the 1925 value. Month to month fluctuations indicate that the decline was fairly consistent throughout the year. There was a moderate pick-up in the fall, but the December volume shrank to the lowest total for two years.

January, 1927, comes up to the monthly average of 1924 and 1926, but whether this is to be considered normal for New York is difficult to say. The year 1925 was one of big projects—74 of the 231 buildings costing $1,000,000 or more. The average contract value was $1,380,000, compared with $910,000 in 1926. These large projects take a year or more to complete. Many of them have just recently been finished and are only now beginning to have their effect on the real estate market. The readiness with which this new floor space is being absorbed will be one of the critical factors in determining what New York's construction volume will be this year. It is surprising that in spite of such a large decrease in the largest metropolis the country as a whole more than held its own in the total value of contracts awarded during 1926.

Business Conditions

DISTINCTLY conservative buying is noted in the electrical industry, but an optimistic attitude prevails and manufacturers say that this condition presages good sales throughout the year. Business is somewhat quiet and is slightly below that of the same period last year. The conditions are parallel to those of 1926, which on the whole was considered a very good year. A manufacturer of control equipment states that his sales to the automotive industries has shown quite a decrease, but despite this his total sales are only slightly less than they were last year. Power companies are prominent buyers in good volume in virtually all sections of the country.

In New England orders from utility companies dominate the trade and there is a tendency to postpone buying. Industrial orders were few and included one for a 5,000-hp. turbo-generator unit with accessories amounting to about $80,000, and another for switch and control apparatus for a southern Massachusetts plant involving $25,000. Central-station companies are buying a good volume of miscellaneous materials in the New York district, and the volume of inquiries being received for distribution transformers and substation apparatus indicates little change in the good demand for this line. In the Southeast orders were placed by one power company for about $30,000 worth of transformers and switching equipment, and another company purchased $10,500 worth of poles. With the exception of central-station purchases business was rather quiet. A lull has been noted in the St. Louis district but the industry is optimistic. Business has decreased in some lines in the Middle West, but a large amount of construction work is contemplated by utility companies. On the Pacific Coast sales are fair but are hampered by a tendency to defer immediate buying. Power company orders have been good and included three transformers, each 3,333 kva., valued at approximately $40,000. One company is also in the market for seven carloads of pole line hardware, and two large industrial plant orders, one for $115,000 and the other for $130,000, are expected to be placed shortly.

Little Interest Shown by Metal Buyers—Prices Steady

The non-ferrous metal market has been quiet. Zinc sales, followed by those of lead, have been most active, the prices of both being substantially unchanged. Sales of copper have been disappointingly small, though a lull was expected after the activity in February. The large producing interests are uniformly quoting 13⅜ cents delivered in the East, and while the sale of odd lots of a hundred tons or so have been made at 13.30 cents and 13.325 cents the sellers are not actively out after business at those levels. Foreign demand for copper has also been exceedingly quiet.

NEW YORK METAL MARKET PRICES

	Mar. 9, 1927 Cents per Pound	Mar. 16, 1927 Cents per Pound
Copper electrolytic	13.35–13.375	13.30
Lead, Am. S. & R. price	7.65	7.65
Antimony	12.5	12⅜
Nickel, ingot	35	35
Zinc spots	7.10	7.025
Tin, Straits	70¼	69¾
Aluminum, 99 per cent.	26	26

Base copper price March 16, 1927, 15¼ cents.

The domestic lead market has not been brisk but a moderate business was done at uniform price levels. The American Smelting & Refining Company has maintained its contract price at 7.65 cents, New York. Such sales as were made at other than this price brought moderate premiums. Virtually all of the sales were for immediate or March delivery. Many of the sales made in the very active period of several weeks ago were for forward delivery. An excellent business was done in zinc, and galvanizers have been buying largely for March and April shipment. The tin market, as frequently is the case, has been erratic.

Central-Station Companies Buying Steadily in New York District

Central-station companies are buying a good volume of miscellaneous materials in the New York district, although individual orders are generally small. Distribution transformers and substation apparatus are in good demand and the volume of inquiries being received indicates little change in this line. Poles, cross arms and line hardware are finding a good market, manufacturers generally reporting that their total volume of sales compares very favorably with the corresponding period last year. Buying of circuit breakers and switching equipment are less active than in other lines, and reports indicate a spotty condition in the demand for these materials. Some sales of transformers to industrial buyers are reported, and the demand for small and medium-sized general purpose motors continues active. Little change is apparent in the demand for control equipment, which remains poor. Jobbers report some improvement in the sales of conduit, fittings, etc.

Utility Company Orders Dominate New England Trade

Orders from utility companies dominate the New England trade. A tendency to postpone buying of electrical supplies and equipment is reported from a number of manufacturers in the district. Industrial orders were few but among these was one for a turbine unit of 5,000-hp. capacity costing with accessories about $80,000. In addition switch and control apparatus for a southern Massachusetts plant was ordered, amounting to about $25,000. In the near future alterations and additions to a large substation in southern Massachusetts will require new control equipment and line extensions to take care of a 20,000-kw. interconnection between the central Maine and Bangor companies.

Small motor orders have fallen off and negotiations are quiet. Transformer inquiries have increased owing to projected substation work which promises to assume considerable proportions. Line hardware and transmission line material sales are spotty. Underground conduit construction is under way in western Massachusetts where a large power cable contract was recently let. Wiring supplies are active. Radio sales are falling off, and appliance sales show about a 10 per cent increase over last years volume for the first quarter.

Business Decreases in Some Lines in the Middle West

There has been a slight decrease in the volume of business transacted in certain lines in the Middle West, but the feeling of optimism, so noticeable at the beginning of the year, still prevails, and better business is expected. A large amount of construction work is contemplated this spring among the various utility companies, and line extension work is under way to a large

extent at this time. Among the interesting orders placed were the following items: Four 1,300-amp. synchronous booster converters, three 500-kva. oil-immersed water-cooled transformers, one 500-kw. synchronous motor-generator set, spare turbine parts valued at $50,000, two 3,000-amp., 15-kv. oil circuit breakers, one four-motor ash-handling crane, ten graphic wattmeters, 3,000 5-amp. watt-hour meters, 900 direct-current watt-hour meters, 40 current transformers, and 2,000 ft. of 2,000,000-circ.mil varnished cambric and lead covered cable. Most appliances are moving fairly well. There has been a good demand for vacuum cleaners and washing machines.

Orders Placed for Breakers and Transformers in Southeast

With the exception of purchases by central-station companies, general activities in the Southeast were rather quiet. Two very satisfactory orders were received from one power company, one being for $17,000 worth of circuit breakers and power transformers and the other for disconnecting switches amounting to $10,000. Another small circuit breaker order from the same power company amounted to $2,700. Line construction activities continue to be reflected in the volume of pole orders, one company having ordered in the past two weeks poles totaling approximately $10,500. Transformers, both distribution and small power, continue in good demand and orders were received from one power company for distribution transformers amounting to $8,000 and power transformers totaling $4,000. Another sizable order recently was for $6,500 worth of underground cable.

No new announcements were made in the industrial field, though there is a good deal of this business in prospect, particularly for textile mill electrification. An electrification contract amounting to about $300,000 has been let for a 12-story industrial building in St. Louis being erected by Sears-Roebuck & Company. Jobbers report a satisfactory activity in general supply and appliance lines. The unusually brisk movement of the latter line is owing to the intensive sales efforts on the part of the larger central-station companies. A jobber reports the closing of a contract calling for the installation of 210 ceiling fans in a large hotel, the amount involved being approximately $7,500.

Large Industrial Plant Orders Expected on Pacific Coast

Business is fair on the Pacific Coast but is being hampered by a tendency to defer immediate buying. Power company buying has included one carload of guy clamps, stock orders for pole line construction material, and three transformers, each 3,333 kva., valued at approximately $40,000. One power company is in the market for pole line hardware totaling seven carloads. Outstanding orders from industrial plants call for two carloads of 25-ft. stubs and one carload of 55-ft. poles for a cement plant and 50 assorted oil-well motors in 35 hp. and 50 hp. sizes. Manufacturers report unusually heavy buying of switchboards, in amounts ranging from $1,000 to $10,000, by power companies, contractors and transportation companies. Two arc-welding sets were purchased by a railroad firm and one by an oil company at a price of about $2,500 each. Other industrial business covered 500 washing machine motors, amounting to about $5,000, and a 100-hp. synchronous motor valued at $2,500.

Sales in the Puget Sound district include a 5,000-kw. transformer for increasing substation capacity, a 200-hp. motor for a sawmill, two 25-kw. transformers for a lumber manufacturing plant, several small motors for a pulp mill and several small heavy starting duty motors for a cold storage plant. Specifications have now been placed for 100 motors, a turbo-generator unit and other equipment for a lumber mill in Everett to cost about $115,000. A pulp mill at Vancouver, Wash., is also asking for bids on about $130,000 worth of motors, switchboards and control apparatus, and four 11,000-kva. transformers have already been purchased. An ordinance for a proposed bond issue of $4,500,000 to cover the cost of the proposed power distribution system is now before the Seattle City Council. The Seattle lighting department is now taking bids on 500,000 lb. of copper, six 330-amp., 45,000-volt switches and a carload of 3½-in. fiber duct.

Lull Noted in St. Louis District But Industry Optimistic

Without any apparent change in conditions, there has been a lull in the electrical business in the St. Louis district. Propositions are being submitted on a number of good-sized central-station jobs, but none of any importance has been closed. Some of the large oil producers are drilling in newly proved sections and are asking for estimates on pumping equipment. There has been very little buying in the great southeast Missouri lead fields, but this is believed owing to the large installations of electrical machinery made during the latter part of 1926. While there are several public buildings in process of construction, the contracts for electrical equipment have not been placed. The present lull is only temporary, and not a manufacturer or jobber is the least bit pessimistic.

Activities of the Trade

Traveling Exhibition of Bakelite in Industry

There is now on tour in the Central states a traveling exhibition of Bakelite in industry, and this exhibition has been announced by the Bakelite Corporation, 247 Park Avenue, New York, by means of a folder entitled "A Caravan of Ideas." The exhibit includes the products of about 200 manufacturers, throughout the United States, who have contributed their devices to be used in the demonstration of Bakelite's varied functions. The itinerary of the exhibition includes presentations at four educational institutions and twelve cities.

Ajax Electrothermic Demonstrates High-Frequency Furnaces

The first of a series of demonstrations of Ajax-Northrup high-frequency furnaces and an inspection of its new plant at Ajax Park, Trenton, N. J., were arranged on Tuesday, March 15, by the Ajax Eletrothermic Corporation. The demonstrations included the operation of a 250-lb. steel melting furnace with a fixed crucible and in which the melting time was 20 minutes, a rapid steel melting furnace in which the crucible is removable for pouring, a continuous rod heating unit in which a ¼-in. iron rod traveling at 60 ft. per minute was heated to any desired temperature below the melting point, and various types of oscillator furnaces.

A luncheon was tendered the visitors at the Stacy-Trent Hotel, after which G. H. Clamer, president of the company, welcomed the guests and pointed out that the demonstrations were the result of ten years of development work on the part of Dr. Edwin F. Northrup, vice-president and technical adviser of the company. Mr. Clamer predicted further developments in high-frequency furnaces and the application of the principle in a large way and to large furnaces.

National Lamp Works to Hold April Contest

A contest, known as the "April Climb" and open to all its agents, including central-station companies and department or chain stores, has been inaugurated by the National Lamp Works of the General Electric Company, Nela Park, Cleveland. Activities on each of the "four stars" of lamp merchandising to promote sales of the new inside frosted "mazda" lamps will be considered, and the contestants' sales of National "mazda" lamps for the month of April, 1927, as compared with similar sales for the preceding month will also be given consideration in the grading. A folder giving the rules of the contest, showing the prizes and illustrating suggested window displays, has been sent to all agents and central-station companies on the mailing list of *Light*, the company's publication.

Norge Corporation Buys Plant for Making Refrigerators

The plant of the Detroit Gear & Machine Company has been acquired by the Norge Corporation of Detroit, which will utilize it for the manufacture of an electric refrigerator embodying a rotary compressor unit. E. E. McCray, president of the McCray Refrigerator Company, has become chairman of the Norge Corporation.

The other officers of the new corporation are: Howard E. Blood, president of the Detroit Gear Company, presi-

dent; W. C. Rand of the Motor Products Corporation, vice-president, and W. C. Rand Jr., secretary and treasurer. On the board of directors will be Du Bois Young, president of the Hupp Automobile Company; G. B. Donaven of Detroit, H. M. Stewart, vice-president of the McCray company, and John C. Schott, vice-president of the Johnson Auto Company and the McMullen Printing Company of St. Louis.

Edison Lighting Institute Holds Another Lighting Conference

The twenty-second conference featuring illumination design was held during the week of Feb. 14 at the Edison lighting institute of the Edison Lamp Works of the General Electric Company at Harrison, N. J. The attendance list of 67 included, in addition to one representative from Strasburg, France, men from central-station companies in all parts of the Eastern states. The conference was planned and carried out especially for the benefit of central-station lighting specialists.

Electric Refrigeration Sells Additional Treasury Stock

The Electric Refrigeration Corporation of Detroit has sold privately 100,000 shares of additional treasury stocks, the proceeds of which are to be used to round out the company's expansion plans and provide additional working capital. The stock was underwritten at $33 a share and was all placed privately. It is expected that application will be made to list the 100,000 shares additional of Electric Refrigeration on the New York Stock Exchange, making a total of approximately 724,000 shares outstanding.

A. H. Goss, president of the company said: "This new financing will replace in the treasury the capital expenditures during the last six months at Detroit and Grand Rapids. The new Detroit building of the Electric Refrigeration Corporation, which represents the most modern plant for quantity production, will be ready for occupancy March 1. A large amount of new machinery has been installed and additional machinery will be moved over from the present isolated Detroit plants when production gets under way in the new plant. The various isolated plants now being operated by the Kelvinator and Nizer divisions will be sold."

Joslyn Manufacturing & Supply Expanding Facilities

The purchase of 48,000 acres of timber land containing Western red cedars and also the purchase of 58 acres in Franklin Park, a suburb of Chicago, for present and future expansion, have been announced by the Joslyn Manufacturing & Supply Company, with headquarters in the Chamber of Commerce Building, Chicago. The company, established in 1902, is now supplying a complete line of outside electrical construction material, including poles, cross-arms, insulators, etc.

It is the intention of the management to start a pole yard and erect several small factories on the Franklin Park property, at the same time making arrangements for the possible removal at a later date of the main plant from the central manufacturing district where it is now situated. At the main plant a new building was recently constructed to house the company's galvanizing and assembling department. The company is a closed corporation with ownership resting largely with President M. L. Joslyn, founder of the enterprise. The other officers are: B. S. Handwork, vice-president; R. C. Boozer, secretary, and A. G. Jarmin, treasurer.

Babcock & Wilcox Gets Order from State Line Company

The 208,000-kw. turbo-generator ordered by the State Line Generating Company, Chicago, for the new power station to be erected on the shore of Lake Michigan, immediately east of the Illinois-Indiana state line, will be supplied with steam by six Babcock & Wilcox boiler units built for 800-lb. working pressure with superheaters, economizers, air heaters, Bailey furnaces and burners, and Fuller-Lehigh unit-mill pulverized coal equipment. The order for the entire equipment has been placed with the Babcock & Wilcox Company, 85 Liberty Street, New York. The boiler units are similar in design to, but somewhat larger than, the pulverized coal boiler unit of the company that has been in service since November in the Calumet station of the Commonwealth Edison Company of Chicago.

Square D Enlarges Plant Capacity

The Square D Company, manufacturer of electrical safety devices, Detroit, is building an addition to its main plant at that city. This addition will enlarge the available floor space by 15 per cent, and according to T. J. Kauffman, treasurer and general manager, will provide increased production facilities. Plans are also under way to enlarge the company's porcelain plant at Peru, Ind., providing double the present floor space.

The General Electric Company as a feature of its fan advertising for 1927 is offering a new outdoor sign. The purpose of the sign is to make it easy to identify dealers who sell General Electric Fans.

The Ohio Brass Company reports for the year ended Dec. 31, 1926, net profits of $2,501,657 after the deduction of charges. This compares with net profits of $2,200,151 in 1925.

The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., announces that it has moved its New York sales office to 28 Warren Street, where complete stocks of safety and knife switches will be carried.

The Trico Fuse Manufacturing Company, Milwaukee, announces that it is now carrying a complete stock of its Trico renewable fuses and other products with its Seattle (Wash.) representative, the Albert S. Knight Company, 2203 First Avenue, South. The company says that this stock is in addition to the complete stock carried by its Los Angeles representative, the Coast Electric Supply Company, 222 South San Pedro Street.

The Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, announces that it is now offering a motor-driven weatherproof howler which can easily be heard above the racket of a noisy industry. It operates on 110 volts, 60 cycles.

The Graybar Electric Company, 100 East Forty-second Street, New York, has selected Fort Wayne, Ind., as the site for its sixty-first distributing house. It is situated at 921 Barr Street. The company states that a complete stock of electrical supplies for industrial, contracting and merchandising requirements will be carried.

The Wadsworth Electric Manufacturing Company, Covington, Ky., is now offering a line of branch-circuit fuse cabinets for flush and surface mounting, and a line of 30-amp., 125-volt, two-pole and three-pole, plug-fuse-type entrance switches with sealed fuses.

The Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, is offering a fiber hand-portable lamp having a floating socket and springs that protect the lamp from knocks and jars. The unit takes type A lamps up to 60 watts.

The Westinghouse Electric & Manufacturing Company has appointed the Iron City Electric Company of Pittsburgh and the Moock Electric Supply Company of Canton and Youngstown, Ohio, as its agent-jobbers. The first-mentioned company will serve the tri-state area of which Pittsburgh is the center, and the Moock Electric Company will distribute through eastern Ohio and contiguous territory.

The Electric Controller & Manufacturing Company, Cleveland, reports for the year ended Dec. 31, 1926, a net profit of $535,664 after all charges and preferred dividends are deducted. This compares with a net profit of $535,865 in 1925. During 1926 $461,200 of preferred stock was retired by the company and a 20 per cent stock dividend was paid in August.

The Western Electric Company plans a new addition to its Hawthorne (Ill.) plant, to be equipped for cable production, at a cost reported to be more than $200,000.

The Champion Switch Company, 550 Abbott Road, Buffalo, N. Y., has acquired a tract of about 10 acres of land at Kenova, W. Va., heretofore held by the Kenova Mine Car Company, and plans the early construction of a new plant for the manufacture of high-tension electric equipment. The company is affiliated with the Jeffery-Dewitt Insulator Company, which has a plant at that place, and which will use a portion of the acquired plant for enlargement of manufacturing facilities.

The W. N. Matthews Corporation, St. Louis, manufacturer of electrical specialties and mechanical painting equipment, has issued new and complete price sheets on its fuse and disconnecting switches. The company says that new sheets on its Matthews "Scrulix" anchors show a reduction in

price on all sizes, and that new sheets on Matthews adjustable reels also show a considerable reduction in price, which has been made possible by an increase in quantity of production. New price sheets have also been issued on Matthews "Holdfast" lamp guards, and three new guards are available for use with the type A lamp.

The Botfield Refractories Company, Swanson and Clymer Streets, Philadelphia, manufacturer of "Adamant" firebrick cement, announces that Frank J. Donnelly has joined the New York office of the company and will cover the New Jersey territory under the direction of Charles C. Phillips, New York district manager. The New York office is at 108 West Thirty-fourth Street.

The W. N. Matthews Corporation, St. Louis, manufacturer of electrical specialties and mechanical painting equipment, announces that L. B. Graves, 1106 East Thirty-eighth Street, Minneapolis, will act as its representative succeeding the J. E. Sumpter Company. The territory covered by Mr. Graves will include the states of Minnesota, North Dakota, and South Dakota and Wisconsin north of the counties of Crawford, Richland, Juneau, Adams, Waushara, Shawano, Oconto and Marinette.

The Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., desiring a closer co-ordination of its motor supply with its electric crane and hoist business, has appointed Fred G. Bell to direct this new development. Mr. Bell was formerly president and general manager of the Zobell Electric Motor Corporation, Garwood, N. J.

The Page & Hill Company, Suite 814 Plymouth Building, Minneapolis, Minn., announces the appointment of L. A. Page, Jr., as a member of the sales staff of the New York office. Mr. Page was formerly connected with the Dayton office of the company and prior to that with its producing department.

The Babcock & Wilcox Company and **the Babcock & Wilcox Tube Company** announce the removal of their Boston offices from 49 Federal Street to the Chamber of Commerce Building, 80 Federal Street.

The Link-Belt Company, 910 S. Michigan Avenue, Chicago, announces the opening of a new branch sales office at 229 Brown-Marx Building, Birmingham, Ala. W. H. Norton, for many years connected with the company's Chicago sales department, will be manager of the new office, and Harold R. Haught, formerly at the Link-Belt Indianapolis Dodge plant, will assist in the sale of silent chain.

The Griscom-Russell Company, 90 West Street, New York, manufacturer of power plant steam specialties, has appointed C. F. Henderson, 542 Call Building, San Francisco, as it new agent in the San Francisco territory.

The Packard Electric Company, Warren, Ohio, announces the appointment of H. C. Lemire & Company, 407 South Fourth Street, Minneapolis, Minn., as its representative in the Minneapolis territory. The Lemire company specializes in electrical power equipment and handles a number of other lines in addition to Packard transformers.

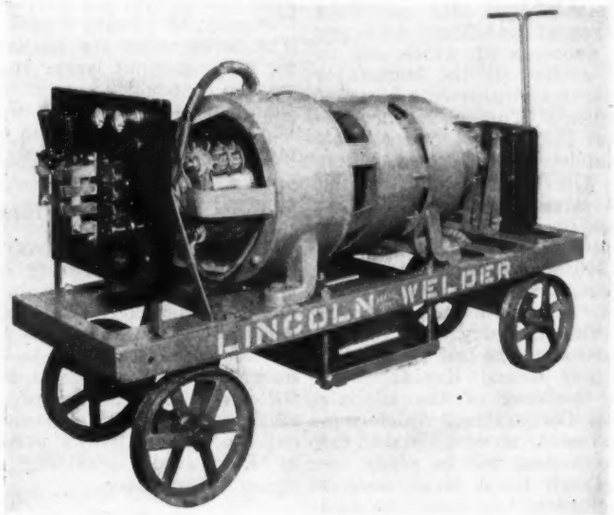
New Equipment Available

Float Switch

A new float switch has been placed on the market by the Industrial Controller Company, Milwaukee, and is intended to fulfill the demand for a heavy, rugged and dependable switch to control alternating-current or direct-current automatic starters or small alternating-current motors, single or polyphase, 2 hp. or less. It is especially designed to operate tank or sump pumps, making it very applicable for railroad service where the switch is so located that it receives little attention. The device consists of a quick make and break switch fully inclosed in a suitable cast-iron housing. The housing is arranged for conduit connection and is weatherproof.

Arc-Welding Machine

A 300-amp. alternating-current power supply Lincoln "Stable-Arc" welder using the welded-steel idea has been placed on the market by the Lincoln Electric Company, Cleveland. There are only two gray-iron castings weighing a total of 15 lb. that have not been replaced with welded steel construction. The motor and generator end rings, brackets and connecting rings are all made of structural angles rolled up into the proper shape and welded together. The feet of the motor-generator set are made of drop forgings. The truck wheels are made of T-sections rolled on a special machine. The hub of the wheel is made of steel tube. The control panel used is made of sheet steel welded together and welded to the supports.



WELDED STEEL IS USED IN BUILDING THIS ARC-WELDING MACHINE

Relay

The type FR relay for use with contact-making instruments, meters and similar devices has been placed on the market by the Roller-Smith Company, 233 Broadway, New York. The electromagnet and switch combination used in the company's type SR relays form the mechanism in the type FR secondary relay. The unit is wound for use on either alternating or direct current from 4 volts to 250 volts, but higher-voltage relays can be supplied on special order. Approximately 0.375 watt is necessary for the operation of the coils. The relay switch is designed to make or break a circuit not exceeding 2 amp. at 250 volts. The manufacturer adds that the type FR relay is susceptible of many modifications to meet special conditions.

Service Switch.—A new type of porcelain-base sealed service fuse switch arranged with test links for both single-phase and polyphase service has been placed on the market by the Wadsworth Electric Manufacturing Company, Covington, Ky. The switches are arranged with the top porcelain mounted near the cover of the cabinet, allowing easy access to all terminals, and the bottom porcelain is mounted on the back of the cabinet so that the blades, jaws and hinges are visible. The manufacturer states that the polyphase switch is made to meet the demand for a three-wire switch arranged with three blades and three fuses and meter-testing facilities.

Trouble Finder.—The Davis trouble finder for locating defects in transmission lines or equipment has been placed on the market by the Davis Emergency Equipment Company, Inc., 67 Wall Street, New York. The trouble finder consists of a special radio loop receiver that is extremely sensitive to electrical disturbances capable of affecting radio sets. The set is portable, works on small dry cells, uses four CX299 tubes, and can be operated by one man. The disturbing frequencies are picked up on the self-contained loop, magnified by a two-stage radio-frequency amplifier, detected, then amplified once more at audio frequencies.

New Trade Publications

LIGHTNING ARRESTERS. — "Protection" is the title of a booklet issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It contains a discourse on the nature and magnitude of transient voltages on electrical systems, describing surge voltages as built up by induction, the scope of a surge, its action and other characteristics. A description of the types SV and LV autovalve arresters, both secondary and distribution types, and a discussion of the economic value of lightning protection are included.

ELECTRICAL MEASURING INSTRUMENTS.—The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, has issued bulletin No. 496, entitled "Surface Condenser Leakage and Boiler Water Concentration," in which it describes and illustrates typical installations of the "L & N" conductivity indicator and recorder in various boiler plants. Charts showing reproductions of actual conductivity records are included.

ELECTRIC STOVE.—A folder issued by the Standard Electric Company, 1714 North Twelfth Street, Toledo, Ohio, describes its model No. 4012 electric range, designed primarily for use in kitchenettes. Attention is also called to other electric devices for apartments and kitchenettes.

LIGHTNING PROTECTION.—The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, is publishing a series of folders discussing modern practice in the design and installation of lightning arresters. Folders Nos. 1 and 2 of this series are now available.

GEARS.—Bulletin GEA-588 issued by the General Electric Company, Schenectady, N. Y., describes the "G-E" gears for centrifugal compressors. Illustrations are given showing various applications of the "G-E" gears to centrifugal compressors.

ALUMINUM PAINT. — The Aluminum Company of America, Pittsburgh, has issued a handbook on the physical properties of aluminum paint and its uses in modern industry. It also describes the composition and characteristics and special properties of aluminum paint.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Hamburg, Germany (No. 24,484), of agricultural implements, especially electric milking machines.

Purchase is desired in London, England (No. 24,562), of bells and indicators, all kinds of electrical household appliances and all types of lamp sockets. An agency is also desired for all kinds of electrical household appliances (No. 24,494). Purchase is also desired of quick-opening door gear for fire stations (No. 24,563).

An agency is desired in Prague, Czechoslovakia (No. 24,493), for hand drills, and portable electric grinders.

Purchase and agency are desired in Berlin, Germany (No. 24,496), for electric specialties and electric transmission equipment.

An agency is desired in Paris, France (No. 24,495), for electrical supplies.

An agency is desired in Cologne, Germany (No. 24,500), for electric hair clippers and for all kinds of electrical household appliances.

An agency is desired in Wellington, New Zealand (No. 24,497), for plain electric portable handsaw, motor-driven hand sanders, electric drills, etc.

An agency is desired in Toronto, Canada (No. 24,499), for electric heating and cooking devices, fans, refrigerators, lighting fixtures, flashlights, batteries, motor-driven household devices and self-contained lighting outfits.

An agency is desired in Bilboa, Spain (No. 24,498), for all kinds of electrical household appliances.

An agency is desired in Zurich, Switzerland (No. 24,492), for household appliances, especially floor cleaning and polishing machines and vacuum cleaners.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

NEEDHAM, MASS.—A permit has been granted the Edison Electric Illuminating Company of Boston to erect a substation on Chestnut Street, to cost about $25,000.

EAST HAMPTON, CONN.—Plans are under way by the N. N. Hill Brass Company for the construction of a hydro-electric plant, to cost about $25,000.

NEW HAVEN, CONN.—Plans have been filed by the United Illuminating Company for the construction of a substation on Middletown Avenue.

Middle Atlantic States

BARTON, N. Y.—The Waverly (N. Y.) Electric Light & Power Company, Binghamton, has petitioned the Public Service Commission for permission to construct and operate an electric light plant in Barton and for approval of a franchise granted by the town. Electricity is furnished by the Northern Pennsylvania Power Company, Towanda, Pa., which leases the plant of the Waverly Electric Light & Power Company.

ELMIRA, N. Y.—Surveys are now being made by the Elmira Water, Light & Railway Company for the proposed 110,000-volt transmission line between Elmira and Binghamton. Under the present plans the Elmira company will build a line to the Chemung County line, a distance of 15 miles, to meet the line from Binghamton. A substation will be established.

JAMESTOWN, N. Y.—The City Council is negotiating with the Niagara, Lockport & Ontario Power Company, for the installation of underground conduit on Second, Third and Main Streets, to replace the overhead system.

MALONE, N. Y.—Permission has been granted the Malone Light & Power Company to extend its distribution system in the town of Belmont in order to supply electric service in the hamlets of Owl's Head and Mountain View.

PERRY, N. Y.—Among the improvements included in the proposed bond issue of $200,000 is the installation of an ornamental lighting system on Main Street.

SALAMANCA, N. Y. — The Niagara, Lockport & Ontario Power Company, Buffalo, has applied for permission to erect transmission lines through the Indian Reservations.

JERSEY CITY, N. J.—The Public Service Electric & Gas Company, Newark, has approved plans for the construction of a substation at its Marion generating plant, to be equipped for switching service, to cost about $2,000,000.

NEWARK, N. J.—Bids will be received by George C. Bergen, county purchasing agent, Court House, until April 22, for furnishing the county with incandescent lamps for a period of one year.

PHILADELPHIA, PA.—Application has been filed with Public Service Commission for charters for three small power companies in Montgomery County to serve as a connecting link between transmission lines of the Conowingo hydro-electric plant, now being built, and the Philadelphia Electric Company. Each company will be capitalized at $5,000, all owned by the Philadelphia Electric Company.

PITTSBURGH, PA.—Plans have been filed by the Duquesne Light Company for an addition to its plant on Brunot's Island. The building will cost about $900,000 and will be used to house a system of electric switches.

LAYTONSVILLE, MD.—Steps have been taken by the town officials for extension of the electric lines from Gaithersburg to Laytonsville.

NORFOLK, VA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Mar. 29, for eight motor generator sets, eight motor generator control panels, and eight sets of spares. Also, for six motor generator sets for the Puget Sound Navy Yard (Schedule 6929).

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until Mar. 30, for 2000 battery terminals and 17,600 terminals (Proposal C. P. 25370-5).

North Central States

ALLEGAN, MICH.—The city of Allegan has applied to the Federal Power Commission for authority to construct a 3,500-hp. municipal hydro-electric plant on the Kalamazoo River.

COOPERSVILLE, MICH. — The Consumers Power Company, Jackson, plans to build a substation in Coopersville.

CINCINNATI, OHIO.—The City Council has awarded a contract to the Cincinnati Gas & Electric Company for furnishing and operating all traffic signal lamps and apparatus.

DAYTON, OHIO.—Steps have been taken by the Chamber of Commerce for the installation of a new street-lighting system in the downtown district.

DEFIANCE, OHIO.—The City Council is considering calling an election to vote on the proposal to issue $405,000 to establish a municipal electric plant.

MANSFIELD, OHIO.—Extensions and improvements are contemplated by the Ohio Public Service Company, Cleveland, to its local system, including the installation of additional equipment, equipping the system with automatic voltage regulators, and the installation of two transformers at the Longview substation. The cost of the building is estimated at $75,000 and equipment, about $250,000.

MIDDLETOWN, OHIO.—The Union Gas & Electric Company, Cincinnati, is considering the construction of a new substation near the old power plant on Canal Street.

FORT WAYNE, IND.—Work will soon begin by the Indiana Service Corporation on the erection of a new transmission line from Fort Wayne to Auburn, to cost about $50,000.

SCOTTSBURG, IND. — The Interstate Public Service Company, Indianapolis, plans to build a substation, equipped with 66,000/33,000-volt transformers near its car house here, to cost about $52,000.

STAUNTON, ILL.—The Illinois Power & Light Corporation, Chicago, is planning to erect a 33,000-volt transmission line from Staunton to Stallings, a distance of about 22 miles.

BELLEVILLE, WIS.—Plans are under way by the Wisconsin Power & Light Company, Madison, to change the voltage of its line between Paoli and Belleville from 2,300 to 11,400 to meet the increasing demand for service in this district.

MINNEAPOLIS, MINN. — Plans are being prepared by the Pillsbury Engineering Company, 2344 Nicollet Avenue, for a power plant for the Minneapolis Manufacturing Company, East Hennepin and Fifth Avenues S. E., to cost about $50,000. The equipment will include a 600-hp. boiler.

MINNEAPOLIS, MINN. — Plans are under way by the Northern States Power Company for the construction of a new substation at Minnetonka Beach to furnish electricity to towns around Lake Minnetonka. The company has recently taken over the business of the Minnesota Power Company, which has served the lake section.

THIEF RIVER FALLS, MINN. — The City Council has awarded the general contract for remodeling the municipal electric plant to the McKenzie-Hague Company, Corn Exchange Building, Minneapolis, to cost about $50,000. The work includes the installation of two water wheels, new flood gates, etc. The Jacobson Engineering Company, 430 Oak Grove Street, Minneapolis, is engineer.

DECORAH, IOWA. — The Interstate Power Company contemplates tunneling through the hill near the lower dam and building another power plant on a lower level.

DES MOINES, IOWA—Work will soon begin by the Des Moines Electric Light Company on the erection of a 66,000-volt transmission line between Des Moines and Prairie City.

SIOUX CITY, IOWA.—The City Council has engaged Arthur L. Mullergren, consulting engineer, Board of Trade Building, Kansas City, Mo., to prepare preliminary plans for a municipal electric plant. Also, for extensions in the ornamental lighting system in the business district.

ST. LOUIS, MO.—An ordinance appropriating $1,550,000 for the installation of 7,600 concrete lamp standards in the dis-

trict bounded by the Mississippi River, the Kingshighway, Delore Street and Choteau Avenue, has been submitted to the Citizens Bond Issue Supervisory Committee. This amount will include lamps, etc., and the erection of a substation. Another ordinance appropriating $325,000 for the installation of lamps on 22 miles of streets, which will be reconstructed this year has also been submitted to the committee.

STANBERRY, MO.—A special election will be held on April 5, to vote on the proposal to issue $30,000, in bond to establish a municipal electric plant.

BLAIR, NEB.—Bids, it is understood, will soon be asked by the City Council for the installation of additional equipment in the municipal electric plant, to cost about $35,000. The Pillsbury Engineering Company, 2344 Nicollett Avenue, Minneapolis, is engineer.

IMPERIAL, NEB.—Plans are under way for extensions and improvements in the municipal electric and water plant, to cost $25,000.

MOOREFIELD, NEB.—The City Council plans to erect a transmission line to Curtis, for electric service at Moorefield. A local distributing system will be installed.

Southern States

ORANGEBURG, S. C.—The Broad River Power Company, Columbia, plans to erect a transmission line from Columbia to Orangeburg and vicinity.

GORDON, GA. — The Georgia Power Company plans to erect a 66,000-volt transmission line from Gordon to Milledgeville, 16 miles long, and to build a transformer station at Milledgeville, equipped with a bank of 4,500-kva. 66,000/44,000-volt transformers, and a supplementary bank of 1,500-kva. 44,000/2,300-volt transformers.

MONTICELLO, FLA.—The General Utilities & Operating Company, Standard Oil Building, Baltimore, Md., contemplates building a local electric plant, and also a cold storage and refrigeration plant.

ANDERSON, TENN. — The Southern Cities Power Company, Chattanooga, plans to erect a 44,000-volt transmission line from Anderson to Stevenson, Ala.

COLUMBIA, TENN. — Plans are being prepared by the Southern Cities Power Company, Chattonooga, for the construction of a hydro-electric power plant on Duck River, near Columbia, to cost about $200,000. Freeland, Roberts & Company, Independent Life Building, Nashville, are engineers.

FAYETTEVILLE, ARK. — Plans are underway by the Southwest Power Company, McAlester, Okla., for the construction of a local substation to cost about $50,000. The company also plans to install an improved lighting system, to cost about $10,000.

HOLLIS, OKLA. — The Southwestern Light & Power Company, Lawton, plans to erect a high-tension line from Hollis to Dodsonville, Tex., a distance of 13 miles, to furnish service there.

DALLAS, TEX. — The budget of the Dallas Power & Light Company for 1927 provides for an expenditure of $386,000 in Dallas. The work includes extension of its underground lines in the business district, installing underground feeder lines to care for the East Dallas district, a power substation in South Dallas, improvements to the main generating plant, maintenance of lines in the city, etc.

Pacific and Mountain States

SUNNYSIDE, WASH. — The Pacific Power & Light Company, Portland, plans to build a new 1,500-kva. substation near Yakima. A transmission line will be erected to the Granger irrigation district to serve the pumping plants there.

FRESNO, CAL.—The City Council is considering the installation of an ornamental lighting system on Belmont Avenue to cost about $12,000.

GLENDALE, CAL.—The City Council has authorized the installation of an ornamental lighting system in the Bellehurst district.

LONG BEACH, CAL.—The City Council has authorized the installation of ornamental lamps on Pacific Avenue, using metal standards.

LOS ANGELES, CAL.—The City Council is considering the installation of ornamental lamps on Hyde Park Boulevard and on Miramar Street.

LOS ANGELES, CAL.—The City Council has approved the installation of ornamental lamps on Wilshire Boulevard, on Alvarado Street and on West Adams Street.

SAN FRANCISCO, CAL.—The Board of County Supervisors has engaged James Whittlesey, electrical engineer, to make a survey of the county lighting system with a view of standardizing and making improvements to same.

SAN JOSE, CAL.—The City Council is considering the installation of an ornamental lighting system on South Market Street. William Popp is city engineer.

AZTEC, N. M.—Extensions and improvements are contemplated by the Aztec Light & Power Company to its system, to cost about $20,000.

Canada

GUELPH, ONT.—The Board of Light and Heat Commissioners are considering the construction of two substations, to cost about $50,000.

LONDON, ONT.—The Public Utilities Commission is considering the installation of a central control system in main station, to cost about $40,000, and building a three-line conduit and placing a section of the Hydro wires underground, at a cost of about $50,000.

WEST HAMILTON, ONT.—The construction of a substation, to cost about $50,000, is under consideration by the Dominion Power & Transportation Company, Ltd.

Electrical Patents

Announced by U. S. Patent Office

(Issued March 1, 1927)

1,618,967. RHEOSTAT; H. E. Adams, Toledo, Ohio. App. filed Sept. 14, 1925. For use with instruments for indicating the level of liquids.

1,618,968. SWITCH CONTACT FOR CIRCUIT BREAKERS; D. R. Davies, Manchester, England. App. filed June 14, 1923. Of the truck panel type; a laminated member.

1,619,002. ELECTRIC METER; G. Sperti, Covington, Ky. App. filed Feb. 16, 1922. A device with registers and indicators which will give direct readings of necessary factors in electrical service. Readings of the volt-ampere-hours, reactive volt-amperc-hours, watt-hours and the maximum demands of these for any predetermined interval of time, as well as numerous other readings.

1,619,010. CONTACT DEVICE AND INSULATION; H. Wilhelm, Brooklyn, N. Y. App. filed Sept. 9, 1925. Adapted for use in a push-button mechanism for floor bells.

1,619,061. LIGHTING FIXTURE; A. Dvorak, Berwyn, Ill. App. filed May 26, 1924. Suspension type.

1,619,080. POLYPHASE RELAY; J. C. McDonald, New York, N. Y. App. filed March 24, 1924. In which electric contacts when made are automatically and mechanically retained in contacting position during any desired interval, either momentarily or for many consecutive hours and until a reversal of the phase, the relay being non-consumptive of electrical energy during such interval.

1,619,134. DOOR-CONTROLLED ELECTRIC LIGHTING SWITCH; J. M. Kern, Oswego, N. Y. App. filed Nov. 2, 1923.

1,619,148. SWITCH; J. T. Miller and M. Hanley, Chicago, Ill. App. filed March 6, 1926. Double-throw switch adapted to be used in conjunction with a lost-motion connection in circuit-controlling mechanisms.

1,619,201. CONDENSER; J. A. Fried, Flushing, N. Y. App. filed April 29, 1926. Inclosed in a housing and connected to a circuit exterior to the housing.

1,619,337. DISTRIBUTION SYSTEM; R. D. Evans, Wilkinsburg, Pa. App. filed Aug. 20, 1924. Wherein a power transmission line of one frequency supplies power to a line operating on another frequency at a plurality of substations interconnecting the lines.

1,619,398. SYSTEM OF CONTROL; E. M. Bouton, East Pittsburgh, Pa. App. filed Oct. 7, 1921. Employed in connection with elevators, hoists and the like. Means for controlling the operating speed of alternating-current elevator motors which are subject to wide variation in loads. Means for effecting accurate stops or landing with an elevator car, regardless of the skill of the operator.

1,619,415. ARMATURE-CORE INSULATION; A. B. Gomory, Anderson, Ind. App. filed Feb. 3, 1923. To improve the manner of insulating the armature core in order that during the winding operation the liability of injuring the insulation of the core or the insulation on the armature conductors shall be minimized; to provide suitable apparatus for carrying out the process.

1,619,425. HEATER; L. J. Levesque and J. Lessard, Bagotville, Quebec, Canada. App. filed May 6, 1926. Constructed in such a manner that it may readily be supported beneath the usual hot air registers or gratings.

1,619,459. AUTOMATIC STATION; C. A. Butcher, East Pittsburgh, Pa. App. filed May 28, 1923. Protective and control system for controlling translating apparatus such as motor-generator units. A protective system for a synchronous motor-generator set whereby non-synchronous operation of the motor may be detected to protect the motor from overheating. Means whereby the excitation of the generator may be quickly controlled to limit the voltage thereof, depending upon the operating condition of the motor. A system whereby the excitation of the generator may be controlled according to a predetermined condition of the load circuit to preclude a tendency for the current to reverse through the generator. A control system whereby the load upon the generator may normally be maintained below a predetermined maximum value but a relatively larger value of current permitted to traverse the generator when it first assumes a portion of the load, while the temperature of the windings of the machine is less than the predetermined value.

1,619,465. PRESSURE SWITCH; C. P. Eisenhauer, Dayton, Ohio. App. filed Dec. 5, 1925. In which the pressure for actuating the switch in one direction during one portion of the movement of the switch will be greater than in the other direction.

1,619,473. MAXIMUM-DEMAND METER; F. C. Holtz, Springfield, Ill. App. filed May 23, 1921.

1,619,517. CONNECTOR FOR ELECTRIC WIRES; W. Hughes, Taunton, Mass. App. filed March 5, 1920.

1,619,564. ELECTRICALLY OPERATED CLOCK; B. C. Campbell, Cleveland, Ohio. App. filed Aug. 21, 1924. Electrically and intermittently operated means for rewinding the actuating spring for the escapement of a clock.

1,619,627. METHOD AND APPARATUS FOR ELECTRICALLY CUTTING METAL; O. H. Neiss, Hamburg, Germany. App. filed Nov. 28, 1925. Cutting metal by the aid of electrodes in the shape of disks operating as rapid friction saws, the electric current to be supplied to the cutting place being generated by induction in the rotating disk-like electrode itself.

1,619,629. TRANSFORMER FOR ELECTRIC ARC CUTTING, REPAIRING AND WELDING APPARATUS; F. C. Owen, Fayetteville, N. C. App. filed Nov. 19, 1925.

1,619,639. LAMP STAND; O. Siebenbrodt, Chicago, Ill. App. filed June 22, 1923. Provided with an adjustable canopy for the top which may be laterally adjusted in several directions.

1,619,640. EXPLOSION-PROOF FUSE; W. W. Sloane, Chicago, Ill. App. filed June 24, 1920. Safety fuse for use in gaseous mines.

1,619,673. SYSTEM OF SPEED CONTROL FOR INDUCTION MOTORS; J. I. Hull, Schenectady, N. Y. App. filed Sept. 10, 1922. Wherein a polyphase commutator machine is concatenated with a load motor for the purpose of regulating its speed over a range including sub-synchronous, synchronous and supersynchronous speeds.

1,619,699. TESTING INSTRUMENT; W. Broad, Beaver Falls, Pa. App. filed June 5, 1924. Miniature millivolt testing battery for high-resistance circuits or circuits containing delicate instruments.

1,619,753. TRANSFORMER FOR ELECTRIC ARC-WELDING APPARATUS; F. C. Owen, Fayetteville, N. C. App. filed July 26, 1924.

1,619,777. AUTOMATIC ELECTRIC TIME SWITCH; D. Zorgo, Montreal, Quebec, Canada. App. filed May 13, 1926. Twenty-four-hour variable adjustable switch adapted to control building lights, etc.

1,619,778. FLASHING PLUG; N. Abramson, Brooklyn, N. Y. App. filed March 6, 1926. Thermostatic switching apparatus, adapted for intermittently flashing lamps or the like, such as electric signs.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

The Increasing Utilization of Water Power—More than 500,000 Hp. Added in 1926

THE increase in developed water power in plants of 100 hp. or more during 1926 amounted to 544,000 hp., or about 5 per cent, bringing the total up to 11,720,938 hp., according to a recent report of the United States Geological Survey.

This increase, although less than in 1923, 1924 and 1925, was greater than in any other preceding year except 1913, that being the year in which the Keokuk plant on the Mississippi and certain other plants went into operation. Comparative figures are given also for a number of earlier years, back to 1910. These show that during the interval of sixteen years there has been almost exactly a threefold increase.

Separate figures for public utility and manufacturing plants are not available for 1910, but comparison with previous reports shows the increase since 1921 to have been confined almost exclusively to public utility plants. The installations in manufacturing plants, amounting in all to one and three-quarter million horsepower, have during that period increased by only about 33,000 hp.

On the face of the statistics there would appear to have been a very considerable decrease in this latter item in 1926, but that is accounted for by the allocation to public utilities of two plants with a total of about 140,000 hp. previously considered manufacturing plants.

An estimate has also been made of the total capacity of prime movers of all kinds. On Jan. 1, 1910, waterwheels constituted 13.7 per cent of the total capacity of prime movers; on Jan. 1, 1927, they constituted 20.7 per cent, showing a comparatively small but nevertheless increasing proportion of water-power development.

In this increase every section of the country has participated. In actual horsepower, however, the growth has necessarily been smaller in the Eastern States, where water power was utilized long before the beginning of the electrical era, than in some of the other sections where industrial development is more recent and where the harnessing of the streams had to await the day when huge and expensive hydro-electric installations became economically feasible.

As a consequence, the percentage in New England has steadily receded from 24.6 in 1910 to 13.1 in 1927, and in the Middle Atlantic States from 22.1 it has dropped with occasional fluctuations to 17.5. The big hydro-electric developments in the Southeast and along the Pacific Coast are reflected in the figures for the South Atlantic States, where the development in 1910 constituted 8.8 per cent of the total in the United States and in 1927 constituted 15.7 per cent; in the East South Central States, which in 1910 had but 0.7 per cent and in 1927 had 7.4 per cent of the national total, and in the Pacific States, where the increase was from 21.4 to 24.0 per cent.

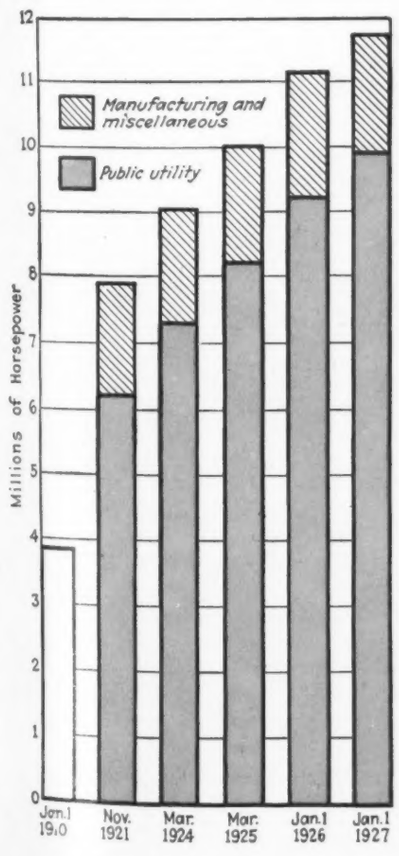
Of this 24.0 per cent, 16.4, or more than two-thirds, is in California, now the leading state in the Union in this regard, with 1,916,980 hp. It wrested first place from New York in 1926.

Meanwhile Alabama, which was not among the ten leading water-power states in 1910, has within the past two years climbed to third place; Washington, formerly eighth, then third, is now fourth; South and North Carolina come next, then Maine, Wisconsin, Georgia and Montana.

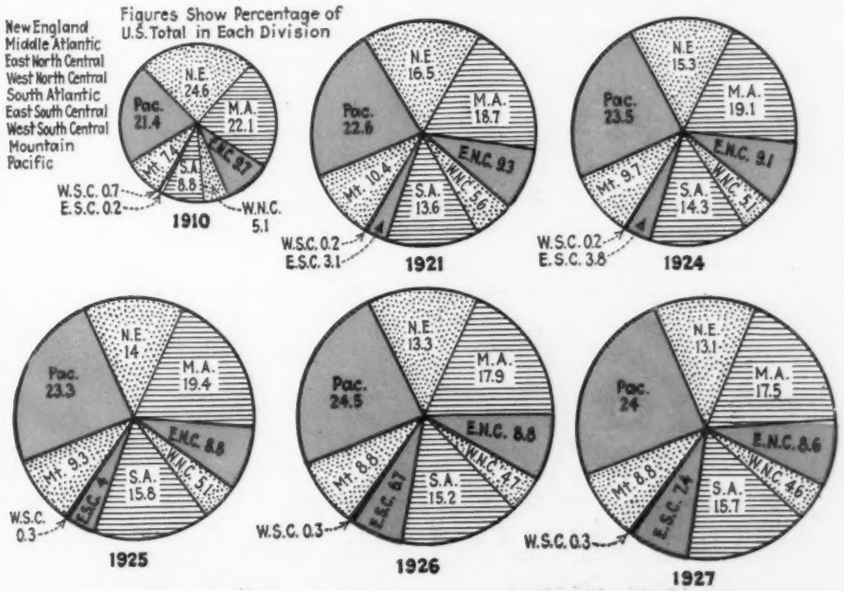
The Northeastern and North Central divisions have a larger proportion of their water-power installations in the form of plants for manufacturing establishments than the other parts of the country. Thus, the percentage in New England is 49.3, in the East North Central States 23.6, in the West North Central 18 and in the Middle Atlantic States 14.5. Contrasted with these figures the South Atlantic States show 13.1 per cent, the West South Central 10.8, the East South Central 4.5, the Pacific 3.6 and the Mountain States 1.9.

Data on the potential water-power resources in the several states were published in the Jan. 1, 1927, issue of the ELECTRICAL WORLD on pages 60 and 61.

Note: In the "Business Facts" of March 5, on page 539, the legends for wired and unwired homes on the second chart should have been interchanged, as was apparent from the context.



At Left, Developed Water Power in the United States
Below, Distribution of Developed Water Power in the United States



Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

North Central States Report Increased Production

THE month of January witnessed an upward trend in the productive operations of the manufacturing plants in the North Central States, a trend which was comparable to the increased production reported in the country as a whole. January productive operations in this section were 6.2 per cent above the operations during December, but were 6 per cent under January of last year. Incomplete data for February indicate that February productive operations were over those of January, but were still some 2 per cent under February of last year. It appears that the year 1927 opened with apparently normal increased operations over December, but with general industrial production in the North Central States on a slightly lower plane than was witnessed during the opening months of 1926. This industrial situation would seem to bear out the opinions expressed by industrialists in general that 1927 industrial production will be slightly under that of 1926. Such are the production operations of industry in the North Central States as indicated from reports received by the ELECTRICAL WORLD on the consumption of electrical energy by about 400 large manufacturing plants operating in the section.

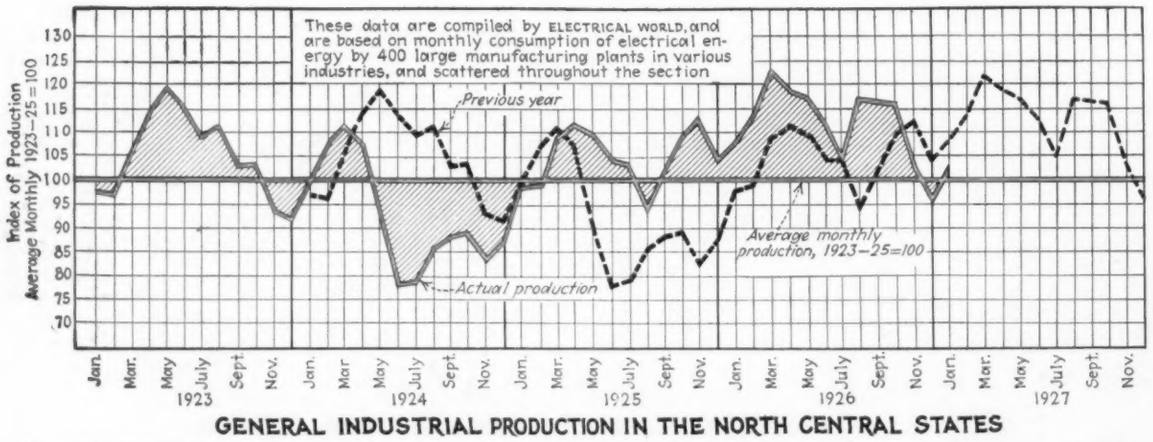
Production in the automobile plants of the North Central States took an upward turn in January, and this upward trend was continued into February. The industry, however, appears to have been operating at about 5 or 6 per cent under the production reported for the same months of 1926. Incomplete reports indicate that February automobile production was about 42 per cent over January but was 6 per cent under February of last year. March and April witnessed the peak of automobile production last year, but it is very unlikely that the production of the present March and April will approach that of the same months of last year.

The metal industries, which include both ferrous and non-ferrous working plants, reported slightly decreased production during January, but there is every indication that February operations were better than those of January. These plants have been operating at a high rate of activity since the summer of 1925.

An abrupt upward turn of considerable proportions was reported by the textile plants, mills and shops of the North Central States during January. Nearly every plant reported materially increased productive operations over December. February activities in the textile plants of this section were materially above those of January.

"Electrical World" Barometer of Industrial Activity in the North Central States

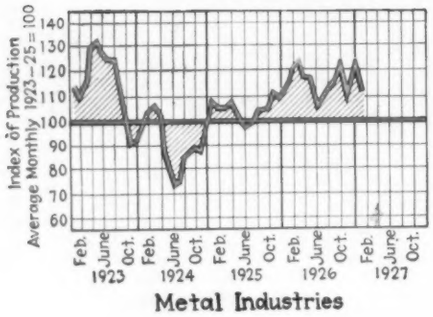
(Data Unadjusted for Seasonal Variation)


These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Previous year
Average monthly production, 1923–25=100
Actual production
Index of Production Average Monthly 1923–25=100
Jan. Mar. May July Sept. Nov. Jan. Mar May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926 1927

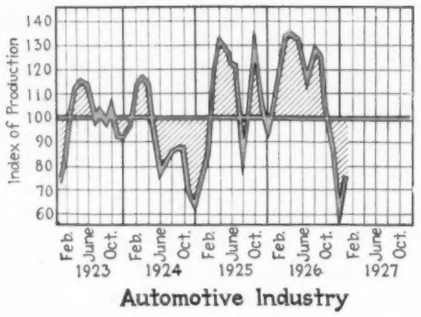
States in **North Central** *Group*

Ohio
Indiana
Illinois
Michigan
Wisconsin
Minnesota
Iowa
Missouri
N. Dakota
S. Dakota
Nebraska
Kansas

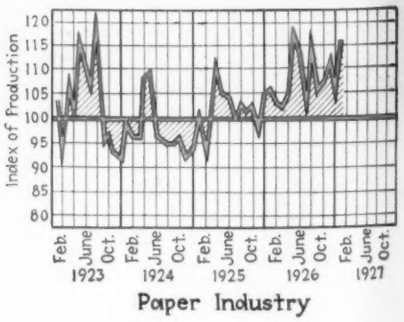
GENERAL INDUSTRIAL PRODUCTION IN THE NORTH CENTRAL STATES


Index of Production Average Monthly 1923–25=100
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1923 1924 1925 1926 1927

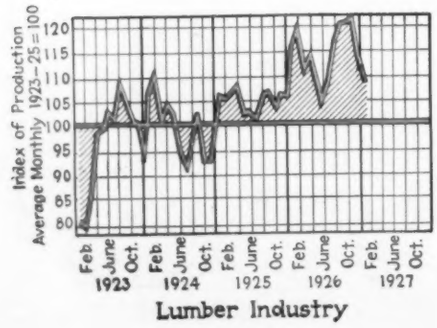
Metal Industries



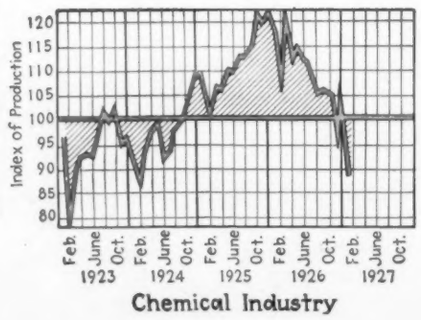
Automotive Industry



Paper Industry


Index of Production Average Monthly 1923–25=100
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1923 1924 1925 1926 1927

Lumber Industry



Chemical Industry

Textiles Industry